Diagnosis and Treatment plan of Complete Denture: Lec:12

It is the critical or scientific evaluation of existing conditions, which is made towards the end of the examination. Diagnosis, being a continuous procedure, is not accomplished in a short time.

Diagnosis defined as:

1- The act or process of deciding the nature of a diseased condition by examination.

2. The determination of the nature, location and causes of disease.

The factors that should be evaluated to arrive at a proper diagnosis and treatment planning:

1. Patients mental attitude.
2. Patient systemic status.
3. Past dental history.
4. Local oral condition.

Mental Attitude (Psychological factor):

The success of dental prosthesis is related to many factors, includes functional, biological, technical, esthetic, and psychological. Psychological factor include the preparedness of the patient and their mental attitudes toward dentures, their relationship with and attitude toward the dentist and their ability to learn how to use the dentures. Prosthodontist must fully understand their patient because such understanding predisposes the patient to accept the kind of the treatment they need.

House classified patients into four categories:

1-Philosophical patient.

2- Exacting patient.

3- Indifferent patient.

4- Hysterical patient.

1-Philosophical Patient: The best mental attitude for denture acceptance is the philosophical type. These patients are rational, sensible, calm, and composed in difficulty situations. Their motivation is generalized as they desire dentures for the maintenance of health and appearance and feel

that having teeth replaced is a normal acceptable process. They are easy going, cooperative, well-adjusted to life and they understand and accept advice. They do not imagine or anticipate any particular difficulty.

2-Exacting patients:-Those patients may have all of the good attributes of the philosophical patients; however, they may require extreme care efforts and patience on the part of the dentist, they like each step in the procedure explained in details, they require extra hours spent prior to treatment in patient education until an understanding is reached is the best treatment plan.

3. Indifferent patients:

They have little concern of their teeth or oral health and do not appreciate the efforts and skill of the dentist. They will give up easily if problems are encountered with the denture. These patients show least concern and often go without dentures for years. They have no desire to wear dentures and do not care much about the need for dentures and function. In most of them, questionable or unfavorable prognosis may be expected. An educational program in dental conditions and treatments is recommended before denture construction.

4. Hysterical patients:

This type is emotionally unstable, excitable, apprehensive and hypertensive. They are neglectful of their oral health and unwilling to try to adapt to wearing dentures. Although these patient may try to wear a denture, they fail to use it because they expect it to look and function like the natural teeth. The prognosis is often unfavorable and additional professional help (psychiatric) is required prior and during the treatment.

Social information:

A. Name: It should be asked to enter in the record. When the patient asked by his name it brings him some confidence. The name also gives an idea about the patient family and community.

B. Age:

A young patient will be more adaptable to new situation such as new denture than an older person. Problem in advancing age can be anticipated with:

1. Adaptation to the new denture.

2. Coordination.
3. Bone resorption.
4. Tissue sensitivity.
5. Healing.
6. Balanced nutrition.

C. Gender:

In general women are more difficult to please with the appearance of their denture than men. They are more aware of their face and lips than men. Males are less concerned with esthetics, they do expect comfort and function.

D. Occupation and social position:

In general the higher the social position, the more demanding the patient about esthetics. A lecturer who speaks too much would be concerned about speech pattern. While a musician who plays a wind instrument, will care for tooth position.

Systemic (medical) status:

No prosthodontic procedures should be planned until the systemic status of the patient is evaluated. It must be realized that dentistry is part of health services and that oral health is closely associated with the general health of the patient. Except in cases of accident, individual who are losing their teeth are manifesting pathological conditions because their lose may be as a result of systemic factors or associated with unfavorable systemic conditions. Some systemic diseases have direct relation to the denture success even though no local manifestations are apparent.

1. Debilitating diseases: Diabetes, blood dyscrasias, tuberculosis are examples. These patient require extra instruction on oral hygiene, eating habits and tissue rest. Consultation of physician is advisable. Supporting bone may be affected so frequent recall is needed to keep the denture base adapted and the occlusion corrected.

Diabetes:

- There may be wasting of tissues.

• Patients need functional rest to the tissues; therefore, they can be advised less time of wear.
• In severe diabetes, acetone is secreted in the mouth, which leads to poor fit of the denture. Hence, the patients are advised to reduce the time of wear of denture.
• Diet rich in vitamin B and vitamin C would have to be recommended. Calcium will have to be supplemented in the diet regime.
• A physician should also be consulted for appropriate control of blood sugar level.
• The condition indicates careful consideration of impression procedure, teeth selection and type of occlusion.

2. Cardiovascular Disease

- Patient should be given early morning appointments in order to avoid the tissue changes that occur due to medication during the latter part of the day.
- The duration of each appointment should be short in order to reduce the stressful condition.
- Patients with such disease may require consultation with cardiologist as some denture procedures may be contraindicated.
- Such patient must be controlled before dental treatment.

Anaemia

• Soft tissue overlying bone becomes fragile with possibility of enhanced bone loss.
• Decrease in bearing capacity of foundation tissue.
• Decrease in healing capacity.
• Advice patient for heamogram, with main emphasis to improve blood picture through administration of haematinic principle.

3. Joint diseases: joint involvement particularly osteoarthritis present different problems. If the disease involved the temporomandibular joint, alteration in the treatment plan may be essential. In extreme conditions special impression tray and technique are often necessary because of the limited access from reduced ability to open the jaws; furthermore jaw relation records are difficult and occlusion correction must be made often because of subsequent changes in the joint. In

case of involvement of finger joints, there may be decreased ability to maintain denture hygiene and insertion.

4. **Neurological disorders:** some neurological involvement as Bell's palsy or Parkinson's requires some attention, dentist have to deal with some problem related to denture retention, maxillomandibular records and supporting musculature.
5. **Skin diseases:** many of dermatological diseases may have oral manifestations such as pemphigus. Medical support mostly needed because these oral lesions are painful that prevent proper work. Pemphigus have oral manifestation which vary from ulcer to bullae. Such painful condition make the denture use impossible without medical treatment. The constant use of dentures is contraindicated.
6. **Oral malignancies:** Some complete denture patient with oral cancer may require radiation therapy. A waiting period should elapse before denture construction. Tissue having bronze color and loss of tonicity are not suitable for denture support. Once the denture is constructed, the tissue should be examined frequently for radio necrosis. Xerostomia can also occur due to radiotherapy. Hence, sialagogues and use of denture adhesives may have to be considered.
7. **Menopause condition:** This condition can cause glandular changes, osteoporosis, burning sensation and psychiatric changes in the patient. These can influence treatment planning and the efficiency of the complete denture.

Past dental history:

Success or failure in the provision of prosthodontic care is frequently the direct result of the adequacy of the taking of the patient's dental history.

An understanding of the etiology of teeth loss by a patient will help a dentist to estimate patent's appreciation of dentistry and contribute to the prognosis for prosthodontic success. Patients who lost their teeth in an accident might be much more unhappy about their edentulous state than patients who lost their teeth as a consequences of decay resulting from neglect, similarly expectation for the amount of alveolar bone remaining would be greater for the patients with a

history of rapid tooth loss from decay than for patient with a long history of progressive periodontal diseases.

Dental history include:

1. Chief complain: It should be recorded because it gives ideas about the patient psychology.

2. Expectation: The dentist should evaluate the patient expectation about denture and classify them as realistic or unrealistic.

3. Period of edentulousness: This gives information about the amount and pattern of bone resorption. The cause of tooth loss should be known (caries, periodontitis etc. -----).

4. Previous dentures: The patient who keep changing dentures in a short period of time are difficult to satisfy and risky to deal with. Any existing prosthesis must be examined thoroughly in an objective manner; to condemn prosthesis on the complaint of the patient is often incorrect diagnosis. Patient oral hygiene can be reflected well by the old denture, and condition of the supported tissues also can be expected. Previous denture experience could be noted in terms of number, duration of time, information on esthetics, phonetics, mastication, retention, vertical dimension of occlusion and centric relation should be noted down. Similarly repairs that has been carried out earlier would include:

a. Repair to a denture.
b. Rebasing.
c. Relining.

Local factors:

The local factors usually evaluated during clinical examinations. . Examination must divided into:

Extra oral examination: The patient head and neck region should be examined for any pathological condition. It include facial examination, muscle tone, lips, TMJ.

- T.M.J: any patient gives a history of T.M.J problem must examine carefully because this type of patients may has a limitation in their jaw movements and opening.

Complaints of pain, subluxation, crepitus or a combination of two or three can be encountered. These could be encountered due to severe discrepancy of vertical dimension of occlusion, loss of teeth or loss of posterior stops, which causes the load to shift anteriorly.

Examination of TMJ

1. The bulk of index finger is placed in the external auditory meatus and equal pressure is applied while instructing the patient to open the mouth. If pain is felt, it indicates abnormal condition
2. Auscultation.

Muscle tone

- Class I: normal tissue tone and function.
- Class II: approximately normal function and tone and tactile sense have been preserved by the wearing of artificial dentures. Patients who have been wearing efficient dentures that restore the correct vertical dimension of occlusion belong to this class.
- Class III: subnormal function and tone, resulted from ill health, loss of teeth or wearing of grossly inefficient dentures.

(Muscle tone that is too tense makes cheek and lips manipulation difficult but if it is too loose, the lips and cheek may be displaced easily by impression material).

Neck palpation

Lymphatics: The first sign of oral cancer is often a palpable lymph node.

Facial examination:

A. Facial form: This is based on outline of face as square, tapering, ovoid, and square-tapering, this helps in tooth selection.

B. Facial profile:

Class 1: Normal or straight profile.

Class 2: Retrognathic profile.

Class 3: Prognathic profile.

Lips:

Patient with short lip will expose all of the upper anterior teeth and much of the labial flange of denture base. Also patient with thin lip present problem because any slight changes in labiolingual tooth position makes an immediate change in the lip contour.

Intraoral examination

A. Color of the mucosa: Healthy mucosa have a pink color, any amount of redness indicates an inflammatory changes. Inflamed tissues provide a wrong recording while making an impression.

B. Condition of the mucosa:

Class 1: Healthy mucosa.

Class 2: Irritated mucosa.

Class 3: Pathologic mucosa.

C. Thickness of the mucosa:

Class I: firm mucoperiosteum with a uniform thickness of approximately 1mm

Class II: thin mucoperiosteum covering supporting bone that is highly susceptible to irritation from denture pressure.

Class III: a thick flabby tissues leading to denture displacement from its supporting area and soreness. Stability and retention are difficult to secure.

Residual alveolar ridge:

A. Arch form

1. U-shape or square form which is the best form to prevent denture rotation.
2. Triangular (tapering) form which offers a less denture resistance to rotation.
3. Round (ovoid) form which gives little or no resistance to denture rotational movements.

B. Arch shape

In the cross section of the ridge there is:

1. Class I: U-shape ridge, the broad flat ridge crest offers excellent denture base resistance to vertical displacing forces.
2. Class II: V-shape ridge but its crest is still flat enough to offer some vertical support
3. Class III: knife edge ridge with a narrow sharp crest that can offer little or no vertical denture support.

C. Height of residual alveolar ridge

1. Class I: Adequate R.R height for denture support which can resist lateral movement of the denture base.

2. Class II: there is some R.R resorption but there is still enough remaining bone to resist lateral movement of the denture base.
3. Class III: resorbed R.R and there will be little or no denture resistance to lateral forces.

Interarch distance:

Class I: there is enough distance to accommodate the dentures.
Class II: there is excessive distance. The denture are usually less stable because the distance between the teeth and the supporting bone is great.
Class III: limited distance. Placement of the artificial teeth can be a difficult procedure.

Bony undercuts

1. Class I: Bony undercut are absent.
2. Class II: There are small undercuts over which the denture can be placed by changing the path of insertion or by relieving the complete denture after pressure indicating paste has been applied to reveal pressure area.
3. Class III: Prominent bilateral undercuts that must be corrected by surgery. Sometimes surgery can be limited to one side only.

Hard palate (shape of H.P):

- Broad flat h.p which offers the best maxillary denture vertical support and retention but can be easily dislodged by a laterally, anteriorly directed forces or rotating forces.
- U-shape h.p which gives adequate denture support, stability and retention.
- V-shape h.p which offers little vertical denture support. Retention is less as peripheral seal is easily broken.

Slope of soft palate (s.p):

*Class I: S.P slopes gradually down from the h.p which allows several millimeters of immovable part of the s.p to form a good posterior seal at its junction with the movable part of s.p.
*Class II: S.P slopes more sharply than Class I thus limiting the seal area and posterior denture length.
*Class III: S.P slopes sharply down from the h.p which restrict the seal area.

A. Size of tongue:

Class 1: the tongue adequate in size to fill but not overfill the floor of the mouth.

Class 2: the tongue slightly overfill the floor of mouth.

Class 3: the tongue completely overfill the floor and cover the ridge, impression making is difficult and denture stability decreased.

B. Tongue position:

Favorable tongue position is when the tip rest at the lingual surfaces of lower ant teeth and the lateral border of tongue contact the lingual surfaces of post teeth and denture base.

Unfavorable tongue position when it is retruded and the tip does not touch the lower denture or ridge. The seal will be broken causing difficulty in wearing denture.

Post mylohyoid space (Lateral throat form)

Class 1: deep lat throat form about 0.5 inch of space exist between the mylohyoid ridge and floor of the mouth. This is favorable for lower denture.

Class 2: Moderate lat throat form.

Class 3: Shallow lat throat form in which retention of lower denture is week.

Saliva:

Class I: saliva is normal in amount & consistency.

Class II: excessive amount of thin watery or thick ropy saliva

Class III: insufficient saliva (xerostomia).

Radiographic examination:

Panoramic, cephalometric, occlusal, and periapical radiography are important because they image: retained root, un erupted teeth, cysts, tumors, foreign bodies, TMJ disorder, osteoporosis and bony pathological changes.

Diagnostic cast-Advantages:

In addition to construction of the special tray, diagnostic cast is used for:

1. Allow for an evaluation of anatomy and relationship in the absence of patient.
2. Evaluation of inter arch distance.
3. Confirmation of intra oral observation.
4. Arch size, anteroposterior relation, and lateral and cross bite relation especially posteriorly will be observed by the dentist.
5. Undercuts determination with surveyor.
6. Soft tissue disease may be more obvious in absence of saliva and color.
7. Displacement from the pressure of old denture more obvious in dry cast.
8. Planning of pre-prosthetic surgery.
9. Education of patient.

Intra oral videography:

Digital videography could display well magnified image on a monitor, this will provide the dentist with rich visual information when developing a treatment plan.

Treatment planning:

The treatment plan: - is the process of matching possible treatment *options* with patient needs and systematically arranging the treatment in order of priority but in keeping with a logical or technically necessary sequence.

It is a consideration of all of the diagnostic findings, systemic and local which influence the surgical or any preprosthetic preparations of the mouth, impression making, maxillomandibular relations, occlusion, form and material of the artificial teeth, and instructions in the use and care of dentures.

Why Treatment plan?

To specifically state the treatment that will address a particular patient's need; this treatment must state in a logical sequences and care.

Prognosis:

It is the opinion and judgement given in the advance of treatment of complete edentulous patient. Denture prognosis is a judgment or opinion of the prospects for success or otherwise in the fabrication and usefulness of the dentures.

Prognosis is influenced by the following factors:

1. Bearing surface anatomy, tongue position and floor of mouth posture.
2. Neuromuscular control.
3. Denture history.
4. Psychological classification.

Patient education:

An initial and continuing activity integral to, and supportive of a treatment plan.

Purposes of education:

1. Inform the patient of their dental health and its significance.
2. Give the patient understanding of significance of edentulism.
3. Match the patient expectation with reality of treatment potential.
4. Explain nature, use, and shortcomings of prostheses.
5. Identify alternative treatment and their consequences.

Vertical jaw relation

Maxillomandibular relationship record: a registration of any positional relationship of the mandible relative to the maxillae; these records may be made at any vertical, horizontal, or lateral orientation.

Vertical dimension: the distance between two selected anatomic or marked points (usually one on the tip of the nose and the other on the chin), one on a fixed and one on a movable member.

Rest vertical dimension (physiologic rest position, Vertical dimension of rest): the postural position of the mandible when an individual is resting comfortably in an upright position and the associated muscles are in a state of minimal contractual activity.

Vertical dimension of occlusion: the distance between two selected anatomic or marked points (usually one on the tip of the nose and the other on the chin) when in maximal intercuspal position.

Interocclusal rest distance (freeway space): the difference between the rest vertical dimension and the occlusal vertical dimension.(2-4mm).

Maxillomandibular relation record provides the optimal separation between the maxilla and the mandible. If this record is not measured accurately, the joint will be strained (overextended or under extended). The vertical separation between the mandible and the maxilla depends on the temporomandibular joint and the tone of the muscles of mastication. If the vertical dimension is altered there will be severe discomfort in both the temporomandibular joint and the muscles of mastication. This relation is easiest to record but is very critical. Errors in vertical dimension are the first to produce discomfort and strain.

Factors Affecting Vertical Jaw Relation

Teeth

These act as occlusal vertical stops and establish the relationship of the mandible to the maxilla in a vertical direction in dentulous patients.

Musculature

The opening and closing muscles tend to be in a state of minimal tonic contraction. This determines the vertical jaw relation. Muscles that produce elevation of the mandible (closing muscles) and gravity also help to control the tonic balance that maintains the physiologic rest position.

Importance of Vertical Jaw Relation

1. Functional roles include: mastication, respiration, deglutition, phonetics.

2. Psychological role.
3. Esthetic role.
4. Comfortable role by maintenance health of tissue, mucosa, bones, muscles and (temporomandibular joint).

Effects of increased vertical relation:

1. Speech problems.
2. Sensation of bulky dentures.
3. Premature contact & clicking during function.
4. Increased rate of residual ridge resorption.
5. T.M.J & muscle pain & fatigue.
6. Poor esthetic like separated lips & display of the teeth.
7. Inability to open the mouth widely.
8. Loss of biting power.
9. Difficulty in swallowing.
10. Increased volume or cubical space of the oral cavity.

Effects of decreased vertical relation:

1. Poor esthetic like thin-lipped appearance, prominence of mandible and chin.
2. Presence of excessive wrinkles & folds in corner of mouth which may lead to angular cheilitis.
3. loss of biting power & decreased chewing ability
4. muscular fatigue& pain in T.M.J region
5. cheek biting
6. Neuralgia or other features.
7. Decreased volume or cubical space of the oral cavity.

Vertical jaw relation can be recorded in two positions:

- **Vertical dimension at rest position**
- **Vertical dimension at occlusion**

Both these relations should be recorded. In a normal dentulous patient, the teeth do not maintain contact at rest. The space between the teeth at rest is called the '*free-way space*'. The free-way space exists only at rest. During occlusion, the teeth come in contact with one another and the space is lost. The same relationship should be produced in the complete denture. Once the vertical dimension at occlusion is recorded, it should be verified with the vertical dimension at rest (the vertical dimension at occlusion should always be 2-4 mm lesser than the vertical dimension at rest). The denture is fabricated in vertical dimension at occlusion so that the free-way space is formed at rest.

Vertical Dimension at Rest

It is defined as, "*The length of the face when the mandible is in rest position*. This is the position of the mandible in relation to the maxilla when the maxillofacial musculature are in a state of tonic equilibrium. This position is influenced by the muscles of mastication, muscles involved in speech, deglutition and breathing. It is essential to record the vertical dimension at rest as it acts as a reference point during recording the vertical dimension at occlusion.

VD at rest = VD at occlusion + free-way space.

The vertical dimension at rest should be recorded at the physiological rest position of the mandible. In patients with prolonged ness, the mandible shifts to a habitual rest position.

The complete denture should not be fabricated using the habitual rest position. Hence the physiological rest position should be determined in these patients before recording vertical jaw relation. When functional movements (swallowing, wetting the lips) are performed, the mandible comes to the physiological rest position before going to the habitual rest position. The physiological rest position is influenced by a number of factors and the following considerations are to be remembered while recording it:

- The position of the mandible is influenced by gravity and the posture of the head. Hence while recording vertical jaw relation the patient should be asked to sit upright, with his/her head upright and eyes looking straight in front.
- Since we are recording a physiological rest position, all the muscles affecting this record should be relaxed. Signs like tension, strain, and nervousness can alter the position of the mandible.
- Presence of any neuromuscular disease in the patient can influence the rest position.
- The patient cannot maintain the physiological rest position for an indefinite period of time. Hence, it should be recorded quickly.
- Incorrect measurement of the rest position can lead to faulty recording of the vertical dimension at occlusion and can lead to injury to the supporting structures and the temporomandibular joint.

Methods of recording V.D.R: V.D.R is measured usually on the face by a ruler between two selected points marked by indelible marker or a triangle of adhesive tape above & below the mouth mostly on the nose & chin. The following methods are used for recording rest vertical dimension:

1. ***Facial measurements after swallowing and relaxing.***
2. ***Tactile sense.***
3. ***Measurement of anatomic landmarks.***
4. ***Speech or Phonetic.***
5. ***Electro-myographic method.***
6. ***Facial expression.***

1-Facial measurements after swallowing & relaxing:

The patient should sit or stand comfortably upright with the head erect with the eyes looking straight ahead, ask the patient to swallow and wipe his lips with his tongue, relax his facial muscles and drop his shoulder. Then measure the V.D.R & repeat until getting a consistent measurement.

2. Tactile Sensation

- The patient is asked to stand erect and open his mouth wide till he feels discomfort in his muscles of mastication.
- Next, the patient is asked to close his mouth slowly. The patient is instructed to stop closing when he/she feels that his/her muscles are totally relaxed and comfortable.
- The distance between the two reference points is recorded and compared to the measurement recorded by the swallowing method.
- This method relies on patient's perception of relaxation, and will vary for each individual. Hence, at least one additional method should be carried out to confirm these readings.

3. Anatomic landmarks

The distance between the pupil of the eye and the rima oris (corners of the mouth) and the distance between the anterior nasal spine and the lower border of the mandible should be measured using a Willis guide. If both these distances are equal, the jaws are considered at rest. Its accuracy is questionable in patients with facial asymmetry.

4. Phonetics

There are two methods by which the rest position can be recorded with the help of speech. In the first method the patient is asked to repeatedly pronounce the letter 'm', a certain number of times and the distance between the two reference points is measured immediately after the patient stops. In the second method the dentist keeps talking to the patient and he

measures the distance between the reference points immediately after the patient stops talking.

5. Electro-myographic method

Rest position of mandible can be determined by means of electromyography which would record the minimal activity of the muscles. All the muscles show greater activity in other positions than in rest position.

6. Facial expression

The experienced dentist learns the advantage of recognizing the relaxed facial expressions when the jaws are at rest. In normally related jaws, the lips will be even antero-posteriorly and in slight contact. The skin around the eyes and over the chin will be relaxed.

Vertical Dimension at Occlusion

It is the vertical dimension of face when the teeth or occlusal rims are in contact in centric occlusion.

Methods of Measuring:

Vertical relation of occlusion are roughly grouped under *mechanical methods* and *Physiological methods.*

Mechanical methods

- Ridge relation
  - — Distance from the incisive papilla to mandibular incisors.
  - — Parallelism of ridges.
- Pre-extraction records
  - — Profile photographs.
  - — Profile silhouettes.
  - — Radiography.
  - — Articulated casts.
  - — Facial measurements.
- Measurement from former dentures

Physiological Methods

- — Power point.
- — Using wax occlusal rims.
- — Physiological rest position.
- — Phonetics.
- — Aesthetics.
- — swallowing threshold.
- — Tactile sense or neuromuscular perception.
- — Patient's perception of comfort.

1. Mechanical methods: including

Distance of incisive papilla from the mandibular incisors:

The incisive papilla is used to measure the patient's vertical relation since it is a stable landmark and is changed little by resorption of residual alveolar ridge. The distance of the incisive papilla from the incisal edge of the mandibular incisors is about 4 mm in the natural dentition. The incisal edge of the maxillary central incisor is an average of 6 mm below the incisive papilla. So the average vertical overlap of the opposing central incisor is about 2 mm. These measurements must be occur in trial dentures on the articulator but they don't appear to be relevant in sever ridge resorption.

Parallelism of ridges

The mandible is parallel to the maxilla only at occlusion. This factor can be used to determine the vertical dimension at occlusion. The mandible of the patient is adjusted to be parallel to the maxilla. This position associated with a 5° opening of the jaw in the temporomandibular joint gives a correct amount of jaw separation. This method cannot be taken as a standard in patients who had periodontal disease and in patients who lost their teeth at different periods of time.

Pre-extraction records

1. **Profile photographs**: Profile photos are made and enlarged to life size. The photographs should be made with the teeth in maximum occlusion. Measurements of anatomical landmarks on the photograph are compared with measurements on the face, using the same landmarks. These measurements can be reevaluated during the try-in appointment.

Disadvantage:

• The angulation of the photograph might differ with the patient's posture.

2. ***Profile silhouettes:*** The word silhouette means outline. An accurate silhouette is made with cardboard or contoured with wire using the patient's photograph. This silhouette can be used as a template. Since the silhouette is taken from a pre-extraction photograph it shows the vertical dimension at rest. It is positioned on the patient's face while recording the vertical dimension at occlusion. The chin should be at least 2 mm above the level of the lower border of the silhouette.

3. ***Profile Radiograph:***

The exposure of a full lateral Cephalometric radiograph is made with the teeth in occlusion. After extraction, trial bases with occlusal rims are made to an apparently correct vertical relation and inserted in the patient's mouth. Radiograph is obtained with the occlusal rims in contact. The two films are compared and necessary adjustment is made to simulate the correct position as in the initial film.

Disadvantages:

• Inaccuracy due to enlargement of the image.

• It is time-consuming and it may result in frequent exposure to radiation.

4. **Articulated casts**

When the patient is dentulous, the maxillary and mandibular casts are mounted in centric relation in articulator. After extraction the edentulous casts are articulated in a separate articulator. The inter-arch distance between the edentulous casts is compared with that of the articulated dentulous casts. This method is valuable with patients whose ridges are not sacrificed during removal of teeth or resorbed during a long waiting period for denture construction.

5. **Facial measurements**

Two tattoo points are marked on the upper and lower halves of the face before extraction. The vertical dimension is measured at occlusion and recorded. This measurement is used after extraction. The distance between the tattoo marks can be measured by recording the distance from the chin to the base of the nose using dividers (or) calipers before teeth are extracted.

Measurements of former dentures

Patient's existing denture is a valuable pre-extraction record. A Boley's gauge is used to measure the distance between the border of the maxillary and the mandibular denture when both these dentures are in occlusion. This measurement is used to determine the vertical dimension at occlusion. The measurements can be correlated with the observation of the patients face to determine the amount of change required.

2. Physiological methods:

Including edentulous patient with no pre-extraction record:

a. Power point: as suggested by Boos, the theory based on that when teeth come into contact, maximum force or power point measured by bi-meter is exerted when this contact occurs at the correct V.D.O. A bimeter is attached to the mandibular record base. This bimeter has a dial, which shows the amount of pressure acting on it.

b. Using Wax Occlusal Rims

A tentative vertical dimension is measured with occlusal rims and the casts are articulated in a tentative centric relation. A tracing device can be attached to the occlusal rims for a graphic tracing. The facial expression and aesthetics are used for the final value.

***c. Physiological rest position*:** a suggested method is to have the patient relaxed when the wax occlusion rims are in place, with the trunk upright & the head unsupported. The patient swallows & lets the jaw relax while the rims are inside his mouth, when relaxation is obvious; the lips are carefully parted to reveal how much interocclusal space is present between the rims. It should be 2-4mm in premolar regions, if it is more than 4mm, the V.D.O may be considered too small & vice versa so the bite rims should be

adjusted until the dentist satisfied with interocclusal space with patient comfort & speech & esthetic considerations. This method is not an exact guide when used with other methods; it will determine relation of mandible to maxillae.

d. ***Phonetics & esthetics:*** it consists of listening to speech sound production .the production of ch, s, & j sounds brings the anterior teeth close together. If the distance is too large, it means that a too small V.D.O may have been established. If the anterior teeth click together when these sounds are made the V.D.O is probably too great.

Esthetics also is affected by vertical relation of mandible to maxillae like skin tone, contour & support of the lips by anteroposterior positions of the teeth. In decreased V.D.O, the lips are not correctly supported & will be more nearly vertical than when supported by natural teeth.

The Esthetic guide to the correct V.D.O is to select teeth that are the same size as the natural teeth & to estimate the amount of tissue lost from the alveolar ridges.

e. ***Swallowing threshold:*** the theory when a person swallows, the teeth come together with a very light contact at the beginning of the swallowing cycle. On this base, a record of the jaws relation at this point is used as V.D.O. the technique involving building a cone of soft wax on the lower denture base in such a way that it contacts the upper occlusion rim when the jaws are open too wide, then the flow of saliva stimulated by a piece of candy with repeated action of swallowing will gradually reduce the height of the wax cone to allow the mandible to reach the level of V.D.O.

f. **Tactile sense or neuromuscular perception**

This is suggested by Lytle, in this technique a central bearing plate is attached to lower occlusion rim and a central bearing screw attached in the palate of maxillary occlusion rim which is adjusted to measure the V.D permits patient to experience through neuromuscular perception the different vertical relations. i.e the screw is adjusted whether by increase or decrease the opening of mouth until the patient indicates that the dimension is about right .

g. ***Patient's Perception of Comfort***

It is a very simple and easy method of determining the vertical relation. Here, the record bases with excessively tall occlusal rims are inserted in to the patient's mouth and the excess base plate wax is removed stepwise till the patient perceives the occlusal height as comfortable. The disadvantage of this technique is that it depends on the patient's co-operation for accurate readings.

The most frequently used tests that aid the dentist in establishing the correct VDO by means of occlusion rims are

1. Visual observation of the space between the rims when the mandible is in its physiological rest position.
2. Judgment of the overall esthetic facial support.
3. Phonetic tests that include observations when the "s" sound is enunciated accurately and repeatedly—the average speaking space.

A further assessment and confirmation of this tentative determination will occur later at the try-in appointment, when teeth are set in the wax trial dentures and the VDO is verified in the mouth. At that time, these methods can again be used to confirm the VDO before completion of the dentures.

Residual Ridge Resorption (RRR)

lec: 1&2

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Residual bone: that component of maxillary or mandibular bone that remains after the teeth are lost.
Residual ridge: the portion of the residual bone and its soft tissue covering that remains after the removal of teeth
Residual ridge crest: the most prominent continuous surface of the residual ridge, not necessarily coincident with the center of the ridge;
Residual ridge resorption: is a term used for the diminishing quantity and quality of residual ridge after teeth are extracted. It is a chronic, progressive and irreversible process with the rate being fastest in the first 6 months after extraction. The size of the residual ridge is reduced most rapidly in the first six months, but the bone resorption activity of the residual ridge continues throughout life at a slower rate, resulting in removal of a large amount of jaw structure. This unique phenomenon has been described as residual ridge reduction.

Post tooth extraction, a cascade of inflammatory reactions is immediately activated, and the extraction socket is temporarily sealed by blood clotting. Epithelial tissues begin its proliferation and migration within the first week and the disrupted tissue integrity is quickly restored. Histologic evidence of active bone formation in the bottom of the socket is seen as early as 2weeks after the extraction and the socket is progressively filled with newly formed bone in about 6 months. The most striking feature of the extraction wound healing is that even after the healing of wounds, the residual ridge alveolar bone undergoes a lifelong catabolic remodeling.

The rate of RRR is different among persons and even at different times and sites in the same person.

A basic concept of bone structure and its functional elements must be clear before bone resorption can be understood. The structural elements of bone are:

a. Osteocytes: These are cells responsible for metabolic activity of bone.
b. intercellular substance or bone matrix consisting of fibrils or called Calcified cementing substance: The calcified cementing substance consists mainly of polymerized glycoprotein. Mineral salts namely calcium carbonate and phosphates are bound to these protein substances.

c. Osteoblasts: Osteoblasts, by their function of forming and calcifying the intercellular substance, are the active bone forming cells. The osteoblasts surround the bone in a continuous layer. In the course of bone formation, some osteoblasts get engulfed in the intercellular substance and become osteocytes.

d. Osteoclasts: Osteoclasts are the cellular components of bone that are responsible for bone resorption. Bone resorption always requires the simultaneous elimination of the organic and inorganic components of the intercellular substance.

Alveolar bone has two structural characteristics. A hard compact outer layer is superimposed on a spongy somewhat resilient substructure. A healthy and thoroughly healed alveolar process has a layer of wear resistant compact bone of varying thickness. Beneath the compact bone is the spongy bone. The spaces between the trabeculae communicate throughout the spongy bone. Bone is constantly undergoing changes in response to replacement and functional demands.

Pathology of RRR:

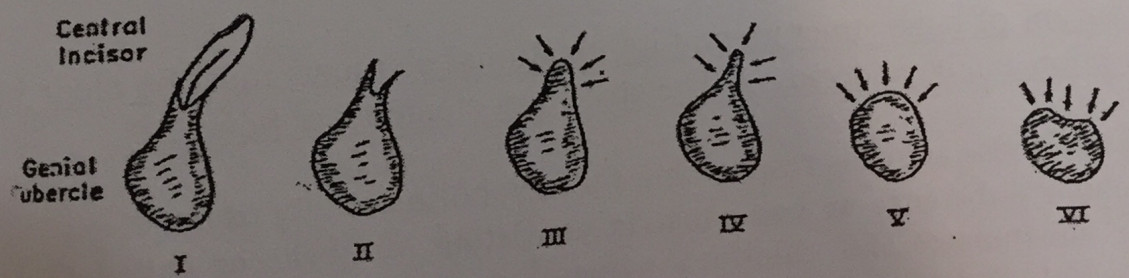
1.Gross Pathology:

A frequent lay expression for RRR is "My gums have shrunk". Actually the basic change in RRR is a reduction in the size of the bony ridge under the mucoperiosteum. It is primarily a localized of bone structure. Sometimes it may leave the overlying mucoperiosteum excessive and redundant.

There exists a wide variety of shapes and sizes of residual ridges.

They are categorized into common residual ridge configuration in a system of six orders given by Atwood Order

Order 1 : Pre-extraction
Order 2 : Post extraction
Order 3 : High, well rounded
Order 4 : Knife-edge
Order 5 : Low, well rounded
Order 6 : Depressed



RRR does not stop with residual ridge, but may go well below where apices of teeth were, sometimes leaving only a thin cortical plate on the inferior border of the mandible or virtually no maxillary alveolar process of the upper jaw. In clinical examination usually one can visually judge the residual ridge form. However, sometimes a knife-edge ridge may be masked by redundant or inflamed soft tissues.

2.Microscopic Pathology: Microscopic studies have revealed osteoclastic activity on the external surface of the crest of residual ridges. The scalloped margins of Howships lacunae sometimes contain visible osteoclasts which cause bone resorption. There exists a wide variation in the configuration, density and porosity of the residual ridges, sometimes even with evidence of osteoporosis.

Studies have shown the presence of new bone and reversal lines inside the residual ridge and minute areas of bony repair on the periosteal side in some specimens. The mucoperiosteum shows varying degrees of keratinization, acanthosis, edema and architectural pattern of mucosal epithelium in the same mouth and between subjects. Similarly, varying degrees of inflammatory cells are found in areas that appear from clinically normal to frankly inflamed in edentulous patients or who were denture or non-denture wearers. Inflammatory cells include lymphocytes and plasma cells. There exists proximity of small blood vessels to area of bone resorption.

Pathogenesis of RRR:

Immediately following the extraction (order II), any sharp edges remaining are rounded off by external osteoclastic resorption, leaving a high well rounded residual ridge (order III). As resorption continues from the labial and lingual aspects, the crest of the ridge becomes increasingly narrow ultimately becoming knife-edged (order IV). As the process continues, the knife-edge becomes shorter and even eventually disappears, leaving a low well rounded or flat ridge (order V). Eventually, this too resorbs, leaving a depressed ridge (order VI).RRR is chronic, progressive, irreversible and cumulative.

According to the American college of prosthodontists: Based on Bone Height (Mandible only)

Type I : Residual bone height of 21 mm or greater measured at the least vertical height of the mandible.
Type II : Residual bone height of 16 - 20 mm measured at least vertical height of the mandible.

Type III : Residual alveolar bone height of 11 - 15 mm measured at the least vertical height of the mandible.
Type IV : Residual vertical bone height of 10 mm or less measured at the least vertical height of the mandible

Direction of bone resorption

- ✓ **Maxilla resorbs upward and inward** to become **progressively smaller** because of the direction and inclination of the roots of the teeth and the alveolar process.
- ✓ The opposite is true of **the mandible, which inclines outward** and becomes **progressively wider.**
- ✓ This progressive change of the edentulous mandible and maxilla makes many patients appear prognathic.

Thus, RRR is centripetal in maxilla and centrifugal in mandible.

Patterns of bone resorption

In the Mandible, large proportions of bone loss occurs in the

- ✓ labial side of anterior residual ridge,
- ✓ equally on the buccal and lingual side in premolar region and
- ✓ lingually in the posterior or molar region.

In the Maxilla bone loss primarily occurs on the labial or buccal aspect.
Therefore, while teeth arrangement we should try to restore the natural position of the teeth before they were lost, Hence

- Teeth in the maxillary arch are arranged slightly labially and buccally .
- While in the mandible, teeth in the anterior region are arranged labially, on the center of the ridge in the premolar region and slightly lingually in the molar region.

Maxilla V/s Mandible

- It is a clinically acknowledged fact that the anterior mandible resorbs 4 times faster than the anterior maxilla.
- Woelfel et al have cited the projected **maxillary denture area to be 4.2 sq in and 2.3 sq in for the mandible**; which is in the ratio of 1.8:1.
- If a patient bites with a pressure of 50 lbs, this is calculated to be **12 lbs/sq in under the maxillary denture and 21 lbs/sq under the mandibular denture**.

The significant difference in the two forces may be a causative factor to cause a difference in the rates of resorption.

- Cancellous bone is ideally designed to absorb and dissipate the forces it is subjected to.
- The maxillary residual ridge is often broader, flatter, and more cancellous than the mandibular ridge.
- Trabeculae in maxilla are oriented parallel to the direction of compression deformation, allowing for maximal resistance to deformation.
- The stronger these trabeculae are, the greater is the resistance

Consequences of RRR:

a. There is apparent loss of sulcus width and depth.
b. Muscle attachments are displaced closer to the crest of the residual ridge. Due to loss of VDO lower face height is reduced and mandible is rotated anteriorly.
c. Patient may develop habitual prognathic appearance.
d. Inter-alveolar ridge relationship is altered.
e. Morphological changes in residual ridge may appear such as sharp, spiny, uneven residual ridges.
f. Resorption of the mandibular canal wall and exposure of the mandibular nerve.
g. Location of the mental foramina close to the top of the mandibular residual ridge. This provides serious problems to the clinician on how to provide adequate support, stability and retention of the denture.

Etiology of RRR

In equilibrium the two antagonistic actions (of osteoblasts and osteoclasts) are in balance. Ingrowth, although resorption is constantly taking place in the remodeling of bones as they grow, increased osteoblastic activity more than makes up for the bone destruction. Whereas in osteoporosis, osteoblasts are hypoactive, and, in the resorption related to hyperparathyroidism, increased osteoblastic activity is unable to keep up with the increased osteoclastic activity.

Ridge resorption varies directly with some systemic or localized bone resorptive factors and inversely with some bone formation factors

$$RRR \propto \frac{\text{bone resorption factors}}{\text{bone formation factors}}$$

Systemic factors influence the balance between the normal bone formation and bone resorption. These factors create a natural resistance to unfavorable local factors. They are-

1. Estrogen.
2. Thyroxin.
3. Growth hormone.
4. Androgens.
5. Calcium.
6. Phosphorus.
7. Vitamin D.
8. Protein.
9. Fluoride.

Some local biochemical factors in relation to periodontal disease which affects the ridge resorption-

1. Endotoxins from dental plaque on unclear dentures.
2. Osteoclast activating factor (OAF).
3. Prostaglandins.
4. Human gingival bone resorption stimulating factors.
5. Heparin acts as a cofactor in bone resorption which is produced from mast cells

RRR is a multi-factorial, biomechanical disease that results from a combination of anatomic, metabolic and mechanical determinants (functional and prosthetic).

1- Anatomic Factors: these factors includes amount of bone and quality of bone.

Amount of bone: When we clinically examine a completely edentulous foundation, we tend to gauge the residual ridge on the basis of it being high/low, broad/narrow, rounded/spiny, covered by thick/thin mucoperiosteum.
The rate of vertical bone loss in broad, high ridge may actually be slower than that of a narrow ridge because there is more bone to be resorbed per unit of time and because the rate of resorption also depends on the density of the bone.

Quality of bone: On theoretic grounds, the denser the bone, the slower the rate of resorption because there is more bone to be resorbed per unit of time.

2 Metabolic factors: it includes both nutritional disturbances and hormonal causative factors.

Metabolic factors:-a.Hormonal Factors

1.Pituitary Glands and Hypophysis

The hypophysis is the master gland of the endocrine system. The control of the hypophysis over the endocrine system is complex and problems of dysfunction require the analysis of an endocrinologist. Such findings are of importance to the dentist because they involve the general health of the patient, which is reflected in the oral cavity.

2. *Thyroid Glands*

They are responsible for the regulation of the rate of metabolism. Hyperthyroidism increases the metabolic rate leading to negative nitrogen balance. Such a balance is equivalent to protein deficiency, which can be a direct cause of osteoporosis. Thyroxin also has a direct influence on the kidneys, causing an increased excretion of calcium and phosphorus. This depletion of calcium and phosphorus results in decreased bone apposition and increased osteoclastic activity.

3.Parathyroid Glands

Parathormone maintains blood calcium by mobilizing it from the bones through osteoclastic activity.

4.Islets of Langerhans

The failure of these glands to produce sufficient insulin for proper utilization of glucose causes diabetes mellitus. The syndrome of poor healing, low tissue tolerance and rapid resorption of bone is associated with the diabetic patient. In the absence of insulin, a relative nitrogen starvation occurs from increased gluconeogenesis with the amino acids being diverted from protein synthesis. A diabetic controlled by either insulin or diet is not affected by this mechanism. Since perfect control is rarely possible, a word of caution and explanation to diabetic patients is necessary so that they can appreciate their prosthetic difficulties.

5.Suprarenal Glands

The adrenal cortex produces steroid hormones called corticoids. Cortisone and related steroids are antianabolic. It may induce the formation of glucose from carbohydrates and may increase the calcium loss by direct effect on calcium excretion. The prolonged use and administration of such steroids are considered very

dangerous to bone tissue. However, one of the beneficial effects of corticoids is to control the defense mechanism of inflammation.

6. Gonads

In general, the sex hormone (*androgens and estrogens*) promotes a protein anabolic action on all tissues including bone. A moderate amount of osteoporosis accompanies senescence because of the increased catabolic action reflected by atrophic and degenerative changes throughout the body. The ageing person produces decreased amount of androgens and estrogens, which results in faulty protein metabolism for tissue repair. The bone matrix suffers and normal bone loss cannot be compensated.

Metabolic factors:b.Dietary Factors

Food is classified as proteins, carbohydrates, fats, vitamins and inorganic elements.

1.Protein

Protein is necessary to build and maintain tissue and to supply energy. The synthesis of osteoid tissue in protein starved people is compromised and calcification is decreased since the protein matrix is embarrassed.

Protein may not be available because of inadequate intake, improper assimilation or excessive loss as in nephrosis or because it is utilized as calorie requirements because of hyperthyroidism/ uncontrolled diabetes.

Inadequate incorporation of protein in diet (3 ounces/ day) will cause slow growth of bone. Bone apposition cannot keep up with normal osteoclastic activity and a negative bone factor exists.

2.Vitamins

The action of vitamins in many respects is said to be same as that of hormones. The relationship of vitamins and hormones can be explained on the basis that the endocrine glands produce intrinsic hormones and the vitamins are extrinsic hormones.

Vitamin A: A deficiency of vitamin A may result in poor development and calcification of bone. Prolonged deficiency of vitamin A causes renal damage by

hornification of tubules, which then lose the capacity to reabsorb phosphorus. The imbalance of the calcium: phosphorus ratio leads to osteoporosis.

Vitamin B complex: The total effect of vitamin B complex is of a regulatory nature. Hypovitaminosis B results in loss of appetite, dietary insufficiency, increase in nervous irritability resulting in lowered resistance to stress and emotional tension. The total well-being of the individual is impaired.

Vitamin C: Lack of vitamin causes decalcification of the bone and has been held responsible for diffuse alveolar atrophy. The apposition of new bone slows down dramatically because osteoblastic activity is impaired. The collagen content of bones is also reduced in vitamin deficiency. The periosteum thickness and the cells appear immature and resemble fibroblasts. This condition may make the periosteum easily prone to injury by the denture base. Osteophytes appear as a result of avitaminosis C. The rapid loss of bone and the increased inflammation of the mucoperiosteum cause the development of these bony outgrowths.

Vitamin D: It is necessary for the calcium phosphorus balance to remain within tolerable limits. Vitamin D would be unnecessary if the exact required ratio of calcium and phosphorus were available in the diet. When bone loses its ability to calcify the matrix, administration of vitamin D will cause calcification and denser bone. Moderate overdosage causes excessively mineralized bone, but gross overdosage causes bone resorption. Many drugs act as vitamin antagonists. These drugs act largely on vitamin C and B complex and their excessive use may cause a marked vitamin deficiency.

Some of the common vitamin inhibitors are nicotine, alcohol, barbiturates, morphine, some of the sulfa drugs and some of the antibiotics such as streptomycin and penicillin.

3.Carbohydrates (Starch and Sugars)

They provide the chief source of energy. They are related only indirectly to bone resorption through association with diabetes and by substitution for more favorable foods.

4.Fats and Organic Substances

They are those, which yield heat and energy and only secondarily build/repair tissue.

5.Inorganic Elements

Calcium salts (calcium carbonate and calcium phosphate)

form the rigid supporting structure of bones. Phosphorus in the form of calcium and magnesium phosphate, gives hardness to bone. Abnormalities of the calcium phosphorus elements of the blood stream may be associated with alveolar resorption or rarefaction.

The body requires 0.7 gm of calcium/day, which can be obtained from 1 quart of milk. Other sources of calcium are dairy products, spinach, oranges, celery,chard, carrots and lettuce. The phosphorus need is about1.5 to 3 gm daily dependent upon the form. Dry beans, milk, cheese, leafy vegetables, celery and carrots mayfulfill these requirements.

Edentulous patients should follow a prescribed dietary regimen. This diet should be low in carbohydrates and high in protein intake. The diet should include at least a quart of milk or substitute dairy products, vegetables, fruits and a multiple vitamin supplement.The normal equilibrium may be upset and pathologic bone loss may occur if either bone resorption is increased or bone formation is decreased, or if both occur.

- Since bone metabolism is dependent on cell metabolism, anything that influences cell metabolism of osteoblasts and osteoclasts is important.
- The thyroid hormone affects the rate of metabolism of cells in general and hence the activity of both, the osteoblasts and osteoclasts.
- Parathyroid hormone influences the excretion of phosphorous in the kidney and also directly influences osteoclasts.
- The degree of absorption of Ca, P and proteins determines the amount of building blocks available for the growth and maintenance of bone.
- Vit C aids in bone matrix formation.
- Vit D acts through its influence on the rate of absorption of calcium in the intestines and on the citric acid content of bone.
- Various members of Vit B complex are necessary for bone cell metabolism.
- In general terms, anabolism exceeds catabolism during growth and convalescence, levels off during most of adult life and is exceeded by catabolism during disease and old age. Bone has its own specific metabolism and undergoes equivalent changes. At no time during life is bone static, but rather it is constantly rebuilding, resorbing and remodeling subject to functional and metabolic stresses.

Osteoporosis and residual ridge modeling:

The clinical and patho physiologic views of osteoporosis has been refined recently to the concept of Type I and II osteoporosis.

Type I osteoporosis is defined as the specific consequence of menopausal estrogen deprivation, and characteristically presents the bone mass loss, notably in the trabecular bone.

Type II osteoporosis reflects a composite of age related changed in intestinal, renal and hormonal function. Both cortical and trabecular bone are affected in Type II osteoporosis.

3.Mechanical :a.Functional Factors:

Functional factors include the frequency, intensity, duration and direction of forces applied to bone which are translated into cellular activity, resulting in either bone formation or bone resorption, depending upon on the patients' individual resistance to these forces.

Wolff's law postulates that all changes in the function of bone are attended by definite alterations in its internal structure. Forces within physiologic limits of bone are beneficial in their massaging effect. On the other hand, increased or sustained pressure, through its disturbance to the circulatory system, produces bone resorption. The amount and frequency of stress and its distribution and direction are important factors in treatment planning. Although the total amount of the necessary masticatory stress cannot be diminished, increasing tissue coverage and decreasing the length and width of the occlusal table may lessen the load/unit area.

The frequency of stress application modifies the reaction of alveolar bone to external forces. Constant pressure on bone causes resorption, while intermittent forces favor bone formation. Since recurrent forces over short intervals of time have essentially the same resorbing effect as constant pressure, a rest period between meals is beneficial. For this reason, the patient should be warned that gum chewing has a destructive effect on the bone.

Bruxism is an expression of nervous tension, which manifests itself as gnashing, grinding or clenching of the teeth while the patient is asleep or awake. Since most denture patients do grind their teeth in sleep, the dentures should not be worn during this period. Thus the supporting structures are afforded the rest period essential to

the maintenance of the alveolar bone. While grinding of the teeth when the patient is awake may be a habit of tension, it may also be caused due to lack of interocclusal distance.

The principal concern should be in the pattern and position of the posterior teeth. There are two mandibular movements associated with mastication: a closing/cutting movement and a lateral or grinding movement. A sharp cusp will penetrate a bolus of food with less force than a flat occlusal form. However, a law of physics explains that forces applied to an inclined plane produce a resultant force or vector perpendicular or right angles to the plane. Applying this principle to occlusal form, the resultant force of the steep incline of high cusps would produce a lateral force, which might cause alveolar resorption.

Stress distribution favorable to healthy alveolar bone maintenance is dependent principally upon bilateral balanced occlusion. Balanced occlusion is that arrangement of the teeth, which will permit the necessary mandibular movements without tending to dislodge the denture or traumatize the supporting structure

3.Mechanical: b.Prosthetic Factors:

The prosthetic factors are extremely difficult to evaluate because of tremendous number of variables, including anatomic, metabolic and functional factors. The traditional design of dentures includes many features whose goal is to reduce the amount of force to the ridge and to thereby reduce RRR.

These prosthetic factors include

- broad-area coverage (to reduce the force per unit area);
- decreased number of dental units,
- decreased bucco-lingual width of teeth,
- and improved tooth form (to decrease the amount of force required to penetrate a bolus of food);
- avoidance of inclined planes (to minimize dislodgement of dentures and shear forces);
- centralization of occlusal contacts (to increase stability of dentures and to maximize compressive forces);
- provision of adequate tongue room (to increase stability of denture in speech and mastication);
- adequate inter-occlusal distance during rest jaw relation (to decrease the frequency and duration of tooth contacts).

Treatment and Prevention of RRR: The best way to manage the problem of residual ridge resorption is by using every means to prevent it.

a. *Prevention of loss of natural teeth.* Clinicians must try to retain residual roots whenever feasible.

b. Proper design of dentures and maintenance.

- ❑ Optimal tissue health prior to making impression.
- ❑ Impression procedures
  - Minimal pressure impression technique.
  - Selective pressure impression technique: places stress on those areas that best resist functional forces
  - Adequate relief of non stress bearing areas eg. Crest of mandibular ridge.
- ❑ Broad area of coverage helps in reducing the force /unit area(Snow Shoe Effect) increased denture bearing area can greatly reduce the load per unit area on the underlying mucosa and improve denture comfort, always assuming that the OVD is not excessive.
- ❑ Avoidance of inclined planes to minimize dislodgment of dentures and shear forces.
- ❑ Centralization of occlusal contacts to increase stability and maximize compressive forces.
- ❑ Provision of adequate tongue room to improve stability of denture in speech and mastication.
- ❑ Adequate interocclusal distance during jaw rest to decrease the frequency and duration of tooth contact. Correcting the occlusal vertical dimension: Clinical studies have shown increased (excessive) OVD to be a common fault in many dentures. Guidelines suggest 2-5 mm of freeway space, but this may need to be increased in order patients or for those patients with atrophic mucosa overlying the residual ridges.

- ❑ Occlusal table should be narrow

The concept and arrangement of teeth in neutral zone helps the teeth to occupy a space determined by the functional balance of the oro- facial and tongue musculature. Eliminating disruptive occlusal contacts, which lead to denture in stability

In general, occlusal tables tend to be too large. This leads to problems of support and stability, which put too much pressure on the atrophic mucosa during function.

- Overdentures help minimize ridge resorption and contribute to enhance retention stability, support of prosthesis along with preservation of proprioception.
- The introduction of dental implants has revolutionized clinical practice. Use of implants for providing implant supported or implant assisted prosthesis also helps avert continuing residual ridge resorption.

Reducing the forces required to drive the denture teeth through the bolus of food: This may be achieved by either increasing the denture bearing area or reducing the size and altering the morphology of the occlusal table.

1- *Increasing the denture bearing area*:
The smaller the size of the fitting surface of the denture, the greater are the loads applied to the underlying mucosa. In such cases, the denture bearing area may be increased using green stick impression compound before relining or by using a chair-side relining material prior to the denture being relined conventionally.
2- *Reducing the size and altering the morphology of the occlusal table.*

c. Nutrition

- It has been seen that one of the cofactor in RRR is low calcium and vitamin D metabolism.
- Diet counseling for prosthodontic patients is necessary to correct imbalances in nutrient intake.
- Denture patients with excessive RRR report lower calcium intake and poorer calcium phosphorus ratio, along with less vitamin D.

d. Preprosthetic surgery:

- Excessive RRR leads to loss of sulcus width and depth with displacement of muscle attachment more to the crest of residual ridge.
- Osseous reconstruction surgeries, removal of high frenal attachments, augmentation procedures, vestibuloplasties etc may be required to correct these conditions.

e. Immediate dentures: Some authors claim that extraction followed by immediate dentures reduces the ridge resorption.

f. Overdentures Tooth supported over dentures help in improved stress distribution there by maintaining the integrity of residual ridge.

A study was conducted with overdentures supported by canines and it was seen that, the bone loss was 0.6mm where as 5mm in conventional complete dentures.

g. Osseointegration and implant

Precautions during extraction to reduce RRR When a tooth is removed the labial plate should be preserved.

- The labial periosteal covering should remain intact as its inner layer is responsible for remodeling of bone.
- If a bone has to be removed it must be the palatal plate.

IMPORTANT NOTES :

1. Reduction of residual ridges (RRR) needs to be recognized for what it is:a major unsolved oral disease which causes physical, psychologic, and economic problems for millions of people all over the world.

2. RRR is a chronic, progressive, irreversible, and disabling disease. At the present time, the relative importance of various cofactors is not known.

3. Much is known about the pathology and the pathophysiology of this oral disease, but we need to know much more about its pathogenesis, epidemiology, and etiology.

4. The ultimate goal of research of RRR is to find better methods of prevention or control of the disease. Because prevention is the key.

OCCLUSAL CONCEPTS IN COMPLETE DENTURE

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OCCLUSION the static relationship between the incising and masticating surfaces of the maxillary or mandibular teeth or tooth analogues.

ARTICULATION It is defined as the contact relationship of maxillary and mandibular teeth as they move against each other.

centric relation CR; a maxilla mandibular relationship, independent of tooth contact, in which the condyles articulate in the anterior-superior position against the posterior slopes of the articular eminences .it is a clinically useful, repeatable reference position.(bone to bone)

centric occlusion : the occlusion of opposing teeth when the mandible is in centric relation; this may or may not coincide with the maximal intercuspal position. (tooth to tooth)

occlusal balance : a condition in which there are simultaneous contacts of opposing teeth or tooth analogues on both sides of the opposing dental arches during eccentric movements within the functional range

occlusal harmony : a condition in maximal intercuspal position and eccentric jaw relation in which there are no interceptive or deflective contacts of occluding surfaces

occlusal interference

1. Any tooth contact that inhibits the remaining occluding surfaces from achieving stable and harmonious contacts;
2. Any undesirable occlusal contact

Maximal intercuspal position the complete intercuspation of the opposing teeth,independent to condylar position

Mandibular movement can be: opening closing, protrusive, and lateral in lateral it may be

- Working side is the side that the mandible move toward it in lateral excursion.
- Nonworking side is the side that the mandible move away from during lateral excursion.

Natural teeth	Artificial teeth
1.Fixed in bone 2.Supported by periodontal ligament 3.Tooth move into socket during mastication because of elasticity of ligament 4.When teeth , move one side during mastication the other side is not affected 5. When teeth move in socket, they produce stretching effect and exert tensile force 6.Tensile force produce stimulation to under lying bone 7.Physiologic stimulation maintain good health of the bone 8.To maintain the stimulus optimal occlusion of natural teeth is important	1.Rest on residual ridge 2.not fixed to soft tissue 3.Denture move toward tissue because of resiliency of mucosa 4.When teeth meet on one side ,the other side loses balance upsetting retention and stability 5.Compression of soft tissue causes displacement of the supporting tissue 6.Compression causes pressure on mucosa of affecting vascular supply of bone 7.Instability of denture causes loss of bone because of leverage 8.To maintain the supporting tissue in good health ,planed occlusion is necessary

Requirements of ideal complete denture occlusion:

1. Stability of denture in both centric and eccentric relation.
2. Balanced occlusal contact bilateral.
3. Cusp height reduced to control horizontal force.
4. Cutting, penetrating and shearing efficiency of occlusal surface.
5. Incisal clearance during posterior function like chewing.
6. Unlocking (removing interference) of cusps mesiodistally.

Objectives of occlusion in complete denture

- Preservation of the remaining tissues
- Proper masticatory efficiency
- Enhancement of denture stability, retention and support
- Enhancement of phonetics and esthetics

Requirement of Complete Denture Occlusion

1. Stability of occlusion in centric relation.
2. Balanced for all eccentric contacts bilaterally for all eccentric mandibular movements.
3. Unlocking the cusp mesiodistally to allow for gradual but inevitable settling of the bases due to tissue deformation and bone resorption.
4. Control of horizontal forces by buccoligual cusp height reduction according to the residual ridge resistance and interridge space.
5. Functional lever balance by favorable tooth to ridge crest position
6. Cutting and shearing efficiency of the occlusal surface (sharp cusps or ridges)
7. Anterior clearance of teeth during mastication. Minimum occlusal
8. contact between the upper and lower teeth to reduce pressure during function (lingualized occlusion)

TYPES OF OCCLUSION

- Balance occlusion
- Lingualized occlusion
- Monoplane occlusion

Balance occlusion

Balance occlusion in complete dentures can be defined as stable simultaneous contact of the opposing upper and lower teeth in centric relation position and a continuous smooth bilateral gliding from this position to any eccentric position within the normal range of mandibular function.

In lateral excursion: (working side)

- ***Anterior teeth-*** the maxillary & mandibular anterior teeth contact on the working side.
- ***Posterior teeth-*** the buccal & lingual cusps of the maxillary & mandibular posterior teeth are in contact. If lingualized occlusion, the maxillary lingual cusp will be in contact with the mandibular lingual cusp.

In lateral excursion: balancing side

- ***Anterior teeth-*** the maxillary & mandibular anterior teeth may contact on the balancing side.
- ***Posterior teeth-*** the lingual cusps of the maxillary teeth will be in contact with the buccal cusps of the mandibular teeth. With monoplane balanced occlusion, usually only the second molars are in contact or the balancing ramp.

Advantages of Balance occlusion

1. Distribution of load
2. Stability
3. Reduced trauma
4. Functional movement
5. Efficiency
6. Comfort

Factors affecting the balanced occlusion (Laws of Articulation Hanau quint)

1. Condylar guidance
2. Incisal guidance
3. The occlusal plane
4. The compensatory curves
5. Cusp angulation

Inter relation between these factors may be described by Theilman's formula

$$\text{Balanced occlusion} = \frac{\text{condylar inclination X Incisal guidance}}{\text{Occlusal planeXcompansatory curveXcusps angulation}}$$

1.Condylar guidance

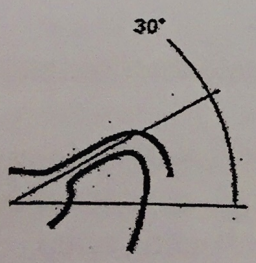
The angle formed by an imaginary horizontal line at the superior head of the condyle and the path that the condyle will pass through during function. It varies from individual to individual because of anatomical differences. About 33°

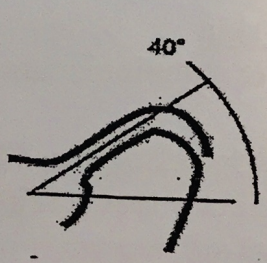
Definitions

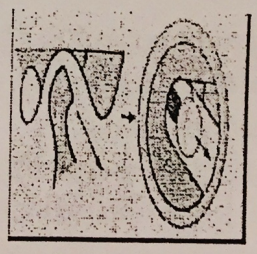
1.condylar guidance: mandibular guidance generated by the condyle and articular disc traversing the contour of the articular eminence GPT9

2.condylar guidance : the mechanical form located in the posterior region of an articulator that controls movement of its mobile memberGPT9

The first factor of occlusion is the condylar guidance, this factor recorded from the patient .so it is fixed factor cannot be modified by the dentist.







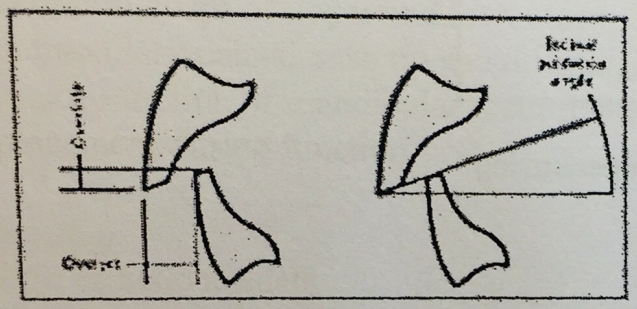
2. Incisal guidance:

Definitions

1. Incisal guidance: - the influence of the contacting surfaces of the mandibular and maxillary anterior teeth on mandibular movements.

It is usually expressed in degrees of angulation from the horizontal by a line drawn in the sagittal plane between the incisal edges of the upper and lower incisor teeth when closed in centric occlusion.

2. Incisal guidance:-the influences of the contacting surfaces of the guide pin and guide table on articulator movements.



Incisal guidance depends on the:

1.Desired over jet.

2.Over bite.

- *This angle varies directly with the vertical overbite and inversely with the horizontal over jet.*
- *This angle is set to 10° in CD and not exceeding 20°*
- *This angle determined by esthetic, phonetic, ridge relation, inter-alveolar distance, this means it is under the control of the dentist,*

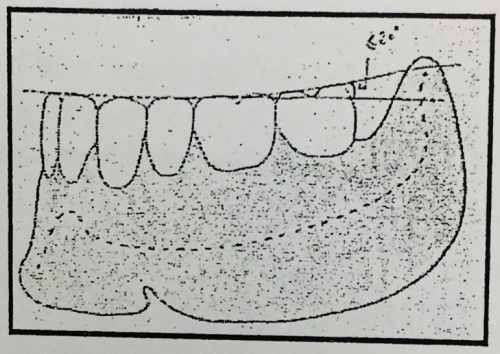
3.plane of occlusion:

1. It is imaginary surface related anatomically to the cranium and theoretically touches the incisal edge of incisors and the tip of occluding surface of posterior teeth
2. Maxillary occlusal plane should parallel to interpapillary line ,posteriorly usually parallel to the ala-tragus line
3. In the mandible established anteriorly by the cusp height of lower canine near the commissure of the mouth(corner) and posteriorly by the retromolar pad.

4.The compensating curve: the arc introduced in the construction of complete removable dental prostheses to compensate for the opening influences

produced by the condylar and incisal guidance's during lateral and protrusive mandibular eccentric movements GPT9

- The compensating curve incorporated in a properly oriented plane of occlusion
- Compensating curve in artificial dentition is anteroposterior curve



Anteroposterior compensating curves

5.Cuspal angulations or inclination of cuspless artificial teeth

It depends on several factors residual ridge,neuromuscular control, esthetics,etc)however, it's better to reduce the cuspal inclination to help reduce horizontal forces of occlusion.

Interaction of the five factor

Of the four that he can control two of them (the incisal guidance and the plane of occlusion) can be altered only a slight amount because of esthetic and physiologic factors. The important working factors for the dentist to manipulate are the compensating curve and the inclinations or cusp on the occlusal surfaces of the teeth.

For the balanced occlusion, it is important to use adjustable articulator

How to record the condylar guidance?

After recording of jaw relation (orientation relation, vertical ,centric jaw relation)then a protrusive record should be made, inorder to set the condylar guidance on articulator according to the following steps:-

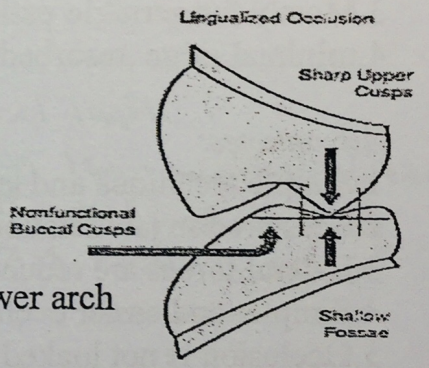
1.place V shape notch.

2. allow the patient protrude aminimium of 5-6mm ,but less than 12mm

3.place elastomeric regestration material between occlusal rim while the patient close in protrude position.
4.after complete setting of material .record base and registration are removed, place on articulator.
5.on the articulator the condylar element release from hinge position, instrument protrude ,they record approximated. The condyle element are rotated untile there is maximum interdigitating of the registration and opposing occlusal rim.

Lingualized occlusion:

It involves use of large upper palatal cusp against wide shallow lower central fossa.
- The buccal cusps of upper and lower teeth do not contact each other.
- The maxillary palatal cusp tip should contact opposite mandibular central fossa.
- The cusp incline of mandibular teeth relatively flat result in less lateral force and displacement during function



Indication:
1.High esthetic needed.
2.Week muscle of mastication.
3.Displaceable supporting tissue.
4.Sever alveolar bone resorption.
5.Discrepancy in jaws size. Narrow upper arch and wide lower arch
6.implant supported over denture.
7.Previous successful denture with lingualized occlusion.

Advantages:
1. Simpler technique. Less precise CR records
2. Esthetics.
3. Better penetration of the food bolus.
4. easer to adjust occlusion
5. it may be used in clII,classIII and cross bite.
6. Centralization of vertical forces.
7. Minimizing tipping force.
8. Potentially of bilateral balance

Disadvantages:-
1.Difficulty in obtaining repeatable centric record (incoordination, jaw malrelation)
2.Severe ridge resorption (lateral forces displace the denture) may more easily be handled with a monoplane scheme

Monoplane or occlusion (neutrocentric) :

- Flat occlusal plane set with non anatomic teeth.
- The antero-posterior occlusal plan parallel to the denture foundation area.
- There is no vertical overlap of anterior teeth.
- Tooth Contact should occur only when mandible in centric relation. .
- Opposing artificial teeth should not contact when jaws in eccentric relation.
- In protrusion there is disclosure of posterior teeth as a result of arrangement in single plane.the patient is instructed not to incise the bolus
- There is no curve of spee or curve of Wilson (compensating curves).

Indications

1.Jaw size discrepancies CI II, Cl lll ,malocclusion and cross bite
2.Uncoordinated jaw movement.
3.Mostly for geriatric patients.
4.minimal ridge ,resorbed ridge ,it reduces horizontal forces—implant may help.

Advantages:

1.Simple technique and less time consuming.
2.Less precise jaw relation records.
3.Lateral forces are reduced by eliminating Cuspal inclines.
~~4.Simpler and easier occlusal adjustments~~. Easier to use in Cl II and III
5.Occlusion is not locked.

Disadvantages:

1.Least esthetic.
2.Poor bolus penetration.
3.Cannot be balanced in eccentric excursions

Types of Occlusal Scheme:

1.Anatomic teeth.

Simulate the natural teeth form with inclination approximately 33 degree

Advantages:

1.Esthetic.
2.Better food penetration.
3.Vertical stress decrease.
4.Harmony with TMJ and muscle of mastication.
5.Balance occlusion in eccentric position

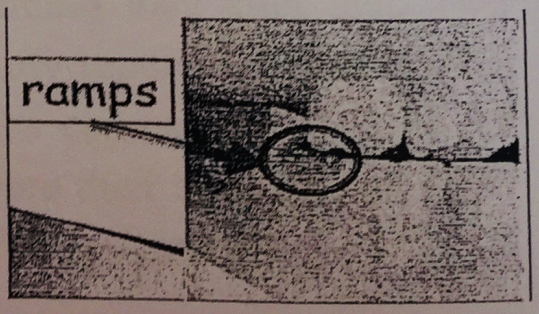
Disadvantages: _
1.Precise technique requires.
2.More time.
3.Difficult teeth position in CL II &CL III
4.Greater lateral fore

2.Semi anatomic teeth
Cusp incline less steep than anatomical teeth called modified anatomical teeth (less than33º)
Advantages:
1.Esthetic.
2.Good chewing efficacy.
3.Less lateral force.
4.Balance occlusion.

Disadvantages
~~*1.least esthetic.*~~ 1. less esthetic than anatomical teeth
~~*2.poor bolus penetration.*~~ 2. less chewing effeciency than anatomical teeth
~~*3.cannot be balanced in eccentric excursions*~~ 3. more difficult to achieve cross arch cross tooth balance

3.Non anatomical teeth:-Flat and without cusp height.
Advantages
1.Used for patient with poor neuromuscular coordination.
2.Used for patient with malrelation jaws.
3.Used for patient with cross bite or class lll.
4.More comfortable.
5.Less time required in set up.
6. slightly more esthetic than neutrocentric occlusion.

Disadvantages: _
•Use of compensatory curve may cause the same damaging effects as cuspal inclines.
•Occlusal adjustment are more difficult to accomplish
• poor bolus penetration
Balance Occlusion For Non Anatomic Teeth May Be Accomplish By
□Compensatory curve
□Tilting the second molar
□Placing the balancing ramp



Factors influencing the selection of selection of occlusal scheme

1. Characteristics of occlusal scheme:
    - Tooth form and arrangement
    - Balanced or not
2. Characteristics of the patient:

- Height and width of the residual ridge
- Aesthetic demands of the patient
- Skeletal relations
- Neuromuscular control
- Tendency for parafunctional activity

Post insertion problems in complete denture

Treating a completely edentulous patient and being able to restore some degree of function, esthetics, and the individuals self- esteem can be a very satisfying experience for a dentist. Or it can be an extremely frustrating experience if things fail to go smoothly and the patient comes back repeatedly with complaints about the quality of the denture and the capability of the dentist. It is unlikely that any dentist can solve all the problems that patients may present. Certainly the best approach is to avoid as many problems as possible. This can be accomplished most effectively by selecting a satisfactory technique and by using care in diagnosis and all phases of treatment. Adequate patient education is also essential. Factors which may limit the prognosis of treatment must be explained to the patient.

Post insertion care is a critical phase in the treatment of the edentulous patient. Scheduled and systemic follow up care can uncover minor problems and complaints which can become major problems if not treated promptly. There are problems arises subsequent to the insertion of complete dentures. These problems may be transient and may be essentially disregarded by the patient, or they may be serious enough to result in the patient being unable to tolerate the dentures. Some complication requiring a quick solution. Another difficulty would be the adaptation of the patient to the required changes in their day time habit pattern which, is not easy. Complete denture problems are divided into many general categories. Specific problems are listed in each category and their probable causes, specific diagnostic procedures, and appropriate corrective measures are present

Complete denture fabrication techniques, and placement of a complete denture are not the final steps in the treatment of edentulous, patients and patient's visit to the dentist continues long after that. Two thirds of the denture wearers surveyed in a study reported that they were "very satisfied" with their maxillary denture as compared with 51% for mandibular dentures, of the individuals who wore their dentures "all day", 5% were "very dissatisfied" with at least one of their dentures.

Many practitioners will experience a situation, when a patient with newly fabricated complete dentures continues the experience difficulty in adapting to them; this can lead to a long period of appointments that may not result in resolution of the problem. Therefore, it is often concluded that there is some patient factor either age, gender, medical or psychological status that is hindering the success of treatment.

Treatment challenges for such patients have traditionally been described as a combination of function, comfort, and aesthetics. Often there is not total agreement between the patient and the dentist as to the adequacy of their dentures.

Several authors cite the most frequent complaints with complete dentures are those pertaining to aesthetics, retention and stability, comfort while eating, and the accumulation of food under the appliance. The factor that most often appears to have an impact on either success or failure of complete dentures is aesthetics. Sometimes the appearance of their dentures prevents from wearing them. The way in which the patient believes he should look is not always in accordance with the clinician's perception of a pleasing appearance. Other studies reported complete denture patients experiencing difficulties with their dentures most frequently complained of looseness of their dentures, aesthetics, difficulty while eating, and accumulation of food under the appliance.

Many factors may influence patients' satisfaction with their dentures:

1. Quality of bone tissue and
2. Oral mucosa of denture bearing area, tissue changes that occur on denture bearing area due to alveolar ridge resorption lead to poorer denture retention and stability which consequently affects patients' satisfaction.
3. The adaptability of the neuromuscular mechanism,
4. Individual feeling of security by denture wearing,
5. Influence of the surrounding muscles on denture flanges,
6. Viscosity of saliva,

7. Patient's age,
8. Position of occlusal plane,
9. Occlusion,
10. Hygiene, type of food, etc.

Classification of denture complaints

- ***According to the time of delivery:***
  - Immediate complaints.
  - Delayed complaints.
- **General classification**
  - ***Complaints about comfort of the denture:***
    - Sore spots
    - Burning sensation
    - Redness
    - Pain in TMJ
    - Tongue & cheek biting
    - Swallowing & sore throat
    - Nausea & gagging
    - Deafness
    - Fatigue of the muscles of mastication
  - ***Complaints about function of the denture:***
    - Instability or poor fit
    - Interference

a) When swallowing

b) Clicking

- ***Complaints about esthetics:***

  - Fullness under the nose
  - Depressed philtrum or naso-labial sulcus
  - Upper lip sunken in
  - Too much of teeth exposed
  - Artificial look

- ***Complaints about phonetics:***

  - Whistle on "S" sounds
  - Lisp on "S" sounds
  - Indistinct "TH" & "T" sounds
  - "T sound like "TH"
  - " F" & "V" sounds indistinct.

PROBLEMS RELATED TO SOFT TISSUE		
Complaints/area	Causes	Treatments
Sore spots – mandible		
Peripheral areas	Overextension	Adjust denture accordingly
	Unpolished or sharp edge	Polish denture borders
	Herpetic or apthous ulcer	Leave denture out as much as possible and wait 7-10 days
Crest of ridge	Bone spicules	Identify the area in denture with pressure – indicating paste and provide relief over spicule and/or surgically remove

		spicule
	Spinous ridge crest	Provide relief in the denture
	Pressure spots at time of impression	Use PIP or indelible pencil to determine the areas and adjust accordingly
	Occlusal prematurities	Correct occlusal defects, recheck vertical dimension and clinical remount
Side of ridge-anterior area	Overextension	Use pressure indicating paste and adjust denture border involved
	Maximum intercuspation not in harmony with centric relation	Enlarge centric area; grind mesial inclined planes of maxillary teeth and distal inclined planes of mandibular teeth using a clinical remount
Side of ridge-bicuspid area	Lingual tori (nonyielding areas)	Provide adequate relief in denture base
	Pressure spots at time of impression	Adjust denture accordingly
	Shrinkage of denture during processing (dimensional changes)	Rebase denture
	Error in occlusion - occlusal prematurities	Check occlusion on the opposite side of arch from the sore spot
	Pressure on mental foramen if ridge is greatly resorbed	Provide adequate relief
Side of ridge-posterior	Overextension in lateral	Shorten posterior of lingual

area	throat area	flange
	Error in occlusion	Check teeth diagonally across the arch from the sore area
	Spinous projection of mylohyoid ridge distolaterally (feeling of sore throat)	Correct undercut surgically; you must under extend the denture. Relieve denture if not severe
	Overextension in anterior area (causes rotation of distal flanges)	Adjust peripheral overextension
Under lingual flange	Maximum intercuspation not in harmony with centric relation (drives mandibular denture forward)	Enlarge centric area and adjust local area-
Under labial flange	Excessive overbite	Adjust anterior occlusion
	Habit- mastication in protrusive relation	Train patient to masticate in centric
Generalized soreness and redness	Heavy biting force- strong musculature	Reduce buccolingual width of teeth; reduce vertical dimension; use soft lining if necessary
	Excessive vertical dimension of occlusion	Reduce vertical dimension
	Locked occlusion	Enlarge centric area
	Failure to provide freedom for Bennett movement (soreness usually on working side	Reduce cusps to a nonanatomical plane or reset teeth
	Improperly processed base material	Rebase denture

Sore spots – maxilla

Peripheral are

Sore spots – maxilla		
Peripheral areas	Overextension	Adjust denture accordingly
	Unpolished or sharp edge	Polish denture borders
	Herpetic or apthous ulcer	Leave denture out as much as possible for 7-10 days
Maxillary frenum	Overextension	Open a V-shaped notch for the labial frenum and widen the buccal frenum areas
Posterior border of denture	Sharp edge at the post dam area	Adjust sharp edge slightly without reducing dam area
Midline of denture	Prominent midsuture or torus palatinus	Provide some relief over the area
Generalized discomfort		
Improper occlusion		Correct occlusion (clinical remount)
Maximum intercuspation not in harmony with centric relation		Enlarge centric area (clinical remount)
Excessive vertical dimension of occlusion		Reduce vertical dimension (clinical remount)
Burning sensation		
Maxillary anterior hard palate and anterior alveolar ridge area	Pressure on anterior palatine foramen	Relieve area over foramen
Maxillary bicuspid area or molar tuberosity	Pressure on posterior palatine foramen	Relieve area over foramen

Mandibular anterior region	Pressure on mental foramen	Relieve area over foramen
Generalized	Improperly processed	Reline denture; replace as much as possible base material with new acrylic resin
Tongue	Allergic reaction xerostoma	
Redness		
Fiery redness - All tissue contacted by denture including tongue and cheeks	Denture base allergy (very unusual)	Remake denture and use all metal base (after allergy test)
Bearing tissues	Ill-fitting denture, Avitaminosis	Remake or rebase dentures. Employ vitamin therapy regimen
Tongue and cheek biting		
Thin or under extended periphery (base material does not provide enough support for the cheek)		Build out thin areas, or extend the short periphery
Insufficient interarch clearance between distal parts of denture bases		Thin maxillary denture over tuberosity; if more space is required, remove it from the retromolar area of the mandibular denture
Inadequate amount of horizontal overlap in molar region		Re-contour buccal surface of mandibular molars and bicuspids; eliminate the tight contact of the maxillary buccal cusps on the mandibular buccal surfaces

Pain in TMJ

Insuffici

Pain in TMJ		
Insufficient vertical dimension of occlusion		Increase vertical dimension of occlusion
Maximum intercuspation not in harmony with centric relation		Make new occlusal record, regrind and remount occlusion
Arthritis		Treat with analgesics
Trauma		Treat with analgesics
Gagging		
Immediately upon insertion	Maxillary denture overextended or too thick in posterior border	Adjust denture or thin posterior border
	Lack of retention	Reline denture
	Mandibular denture too thick in distolingual flange	Reduce thickness or distolingual flange
Delay (2 weeks - 2 months after insertion)	Incomplete border seal allowing saliva under denture	Increase border seal with self-curing acrylic resin (possibly at the posterior palatal border
	Improper occlusion causing denture to loosen and allowing saliva under denture	Correct occlusion (clinical remount)
Deafness		
Decrease vertical dimension of occlusion (rare)		Increase vertical dimension of occlusion
Fatigue of the muscles of mastication		
Excessive vertical dimension of occlusion		Reduce vertical dimension of

	occlusion
Insufficient vertical dimension of occlusion	Increase vertical dimension of occlusion

PROBLEMS RELATED TO FUNCTION

Complaints/area		Causes	Treatments
Instability			
Looseness of mandibular denture		Error in occlusion (maximum intercuspation not in harmony with centric relation)	Correct faulty occlusion by remount and regrind procedure
		Occlusion plane too high	Reset teeth at a lower plane
		Underextension of periphery (inadequate impression)	Rebase denture providing proper extension
		Inability of patient to master denture	Use denture adhesives to help develop skill in handling denture (for a short time only)
		Tongue position (retracted tongue)	
Looseness of maxillary denture	Occasionally	Underextension in some area	Correct with self-curing acrylic resin; first check with compound for diagnostic purpose
		Faulty occlusion	Correct Occlusion
		Overextension of	Adjust denture

		peripheries	accordingly
		Dehydration of tissue due to alcoholism	Remove cause
		Displacement of flabby tissues when making impression	Correct surgically; modify impression technique to change primary denture stress-bearing area to the buccal shelf
	When eating on either side	Nonyeilding area in hard palate (ridge tissue yields under chewing stresses; denture rocks on hard area	Provide relief chamber over non-yielding area
		Incorrect tooth position (teeth may beset too far buccally off ridge	Rebalance in lateral excursions; reset teeth where nature should have had them
		Chewing resistant foods	Instruct patient to maintain soft diet until mouth is conditioned to wearing denture
	Approximately every 2 hours	Heavy mucinous saliva	Prescribe astringent mouthwashes and regular scrubbing of dentures; reduction of carbohydrate
		Incorrect tooth position (teeth may be set too far buccally and labially	Correct surgically; change primary denture stress -bearing area to

			the buccal shelf
		Improper incising habits	Train patient to masticate in centric relation
		Loss of posterior palatal seal (seal on hard palate; posterior limit not in hamular notches; insufficient valve seal)	Increase postpalatal seal with self-curing acrylic resin; first use compound as a diagnostic aid
	When yawning or opening wide	Denture base too thick in buccal posterior area (coronoid process exerts forward and downward force on posterior of denture upon opening)	Reduce thickness of denture base
		Overextended in hamular notch	Shorten denture until pterygomaxillary ligament does not exert tension on posterior border when mouth is opened wide
		Inadequate posterior palatal seal	Increase postpalatal seal with self-curing acrylic resin
	When talking	Inadequate posterior palatal seal	Increase postpalatal seal with self-curing acrylic resin
		Overextended in posterior region	Shorten posterior until soft palate does not lift

			upward and break contact with the denture base
	When occluding in centric relation	Improper occlusion	Correct occlusion
		Poor denture foundation (flabby tissues over ridge)	Correct surgically; change primary denture stress-bearing area to the buccal shelf
		Incorrect tooth position (teeth set too far buccally)	Reset teeth
		Maximum intercuspation not in harmony with centric region	Enlarge centric area
		Nonyielding area in hard plate	Provide relief in area
	Only a feeling of looseness (support and retention are present yet denture feels suspended in mouth	Large area of nonyeilding tissue in hard plate	Provide relief chamber, adequate to permit denture to be properly seated
Interference			
When swallowing		Maxillary denture too thick or over-extended in posterior region	Reduce thickness or adjust posterior

	Mandibular denture too thick or overextended in posterior lingual flange area	Reduce thickness or adjust posterior lingual flange area
	Insufficient vertical dimension of occlusion	Reduce vertical dimension
	Excessive vertical dimension of occlusion	Reduce vertical dimension
	Incorrect tooth position (posterior teeth set too far lingually - tongue crowded	Reset teeth
Clicking	Excessive vertical dimension of occlusion	Reduce vertical dimension
	Ill-fitting dentures	New dentures
	Overextended lower dentures	Reduce peripheral length

Complaints	Causes	Treatments
Fullness under nose	Labial flange of maxillary denture too long or too thick	Reduce length or thickness of labial flange
Depressed philtrum	Labial flange of maxillary denture too short	Increase length or thickness of labial flange
Upper lip sunken in	Maxillary anterior teeth set too far lingually	Reset anterior teeth labially
Too much of the teeth are exposed	Excessive vertical dimension of occlusion	Reduce the vertical dimension of occlusion
	Incisal plane too low	Reset teeth at higher plane
	Cuspids and lateral incisors too prominent	Adjust accordingly
Artificial appearance	Technique setup (teeth are too regular in alignment)	Individualize by rotating and shortening some teeth
	All teeth in same shape	Choose different but complimentary shades; use staining techniques

	Lack of individualization of teeth	Grind incisal edges and angles
	Lack of individualization of denture base	Individualize gingival contour and color of denture base

PROBLEMS RELATED TO PHONETICS

Complaints	Causes	Treatments
Whistle on "S" sounds	Air stream passes unimpeded or with inadequate impedance between the dorsal surface of the tongue and the anterior palate	Increase the palatal resin convex contours lingual to the maxillary central incisors to impede the air stream passing between the tongue and palate. Create rugae if necessary
Lisp on "S" sounds	The air stream passing between the tongue and anterior palate is excessively impeded, usually by rugae or excessive resin contour(to small anterior air space).	Thin the palatolingual area
Maxillary & Mandibular incisors or premolars contact during sibilant (s, sh, z, ch) sounds	Occlusal vertical dimension too great	Reduce occlusal vertical dimension until premolars no longer contact during speech

Clinician observes that incisal edges of maxillary incisors contact the lower lip 1 mm or more labial to the wet/dry junction of lower lip when "F" & "V" sounds are made	Maxillary teeth may be set too far labially	Evaluate lip support and overall appearance of anterior teeth as they are positioned. Reset to a more lingual postiion as needed. incisal edge of maxillary incisiors should contact the wet dry junction ro just lingual to it during production of the "F" & "V" sounds.

A study done for CD complains. The results showed that the number of mandibular dentures requiring adjustments was significantly higher than maxillary dentures in all the post-insertion appointments.

Most frequently injured maxillary areas were posterior palatal seal area in the soft palate (27%), in the mandible, the most frequently injured areas were retromylohyoid area (48.6%).

The least common locations for maxillary ulcerations were hard palate and mid-palatal suture (0%), incisive papilla and rugae (0.65%), tuberosity (2.6%), and buccal and labial sulci (4.6%). The lowest frequency of lesions in the mandible was seen in the sublingual fold (0%), labial sulcus and mylohyoid region of the lingual sulcus (1.2%) and buccal frenum and buccal shelf (2.1%).

No significant differences were detected between males and females in terms of mucosal injuries in the above-mentioned anatomic areas of the maxilla and mandible.

The most frequently observed faults in denture construction related to retention and vertical and horizontal jaw relationships. There is significant relationship between inadequate retention and in proper intermaxillary relationships and patient's complaints of looseness and difficult eating.

clinician must carefully evaluate the denture for faults in horizontal and vertical jaw relationships before concluding that the patient's complaint is related to age, gender, or general medical condition

Limitations of Dentures

- Dentures are less efficient than natural teeth
- Some people can eat all foods easily, but these are the exception
- Generally the better the ridge form, the fewer problems are encountered. Patients with minimal ridges should be advised that their dentures will likely move (especially the mandibular) and their efficiency will therefore be reduced.
- Patients with minimal ridges will likely encounter more sore spots than others.
- It is wise to point out these limitations to patients prior to the delivery appointment so that it is viewed as an explanation, rather than an excuse.

Adaptation to Dentures

Adaptability is affected by:

1. Length of time wearing dentures.
2. Amount of residual ridge remaining.
3. Degree of changes made in new dentures.
4. Individual variation (e.g. patients with more acute **oral** sensory perception have more difficulty adapting).

Adaptation to Chewing may be affected if:

1. CO has been changed to coincide to CR.
2. Tooth positions (esp. incisors) have changed.
3. Vertical dimension has changed.

These patients may experience initial decreased efficiency, cheek or lip biting. Adaptation may be improved by initially eating soft foods, increasing to hard foods, cutting food into smaller pieces, and placing food towards the corners of the mouth. Adaptation may be accompanied by an initial, transitory increase in saliva. Patients should be advised of the need to persevere while their neuromusculature adapts to the new prostheses.

Speaking may be affected by changes in:

1. Tooth position (esp. anteriors).
2. Tongue space (particularly if patients have been without dentures for some time).
3. Palatal contours.

Initial speaking problems are usually transitory, since the tongue is very adaptable – tooth positions must be close at delivery, however).

Appearance may be changed in some individuals. These changes are usually due to:

1. Increasing length of incisors (worn).
2. Changes in vertical dimension.
3. ~~1.~~ Improved lip support (not help with wrinkles).

Prosthodontics

Lec. 8

IMMEDIATE DENTURES

ا م د.رغداء كريم جاسم

Definitions:

- *Immediate denture is a denture which is entirely constructed before the extraction of the teeth and inserted immediately after the extraction of the teeth.*
- *A complete denture or RPD fabricated for placement immediately following the removal of natural teeth. After healing, the denture can be relined and refitted to be used as a definitive denture.*

ADVANTAGES OF IDS:-:

1. The primary advantage of an immediate denture is the maintenance of a patient's appearance because there is no edentulous period.
2. Circumoral support, muscle tone, vertical dimension of occlusion, jaw relationship, and face height can be maintained. The tongue will not spread out as a result of tooth loss.
3. Less postoperative pain is likely to be encountered because the extraction sites are protected. Some authors have discussed whether immediate dentures reduce residual ridge resorption.
4. Bandage or dressing effect that the prosthesis offers to wound extraction, bandage effect tends to control hemorrhage, to prevent large outside contamination of wound and to maintain drug or other therapeutic agent at the site of wound.
5. It is easier to duplicate (if desired) the natural tooth shape and position, plus arch form and width.
6. The patient is likely to adapt more easily to dentures at the same time that recovery from surgery is progressing. Speech and mastication are rarely compromised, and nutrition can be maintained.
7. Overall, the patient's psychological and social well-being is preserved. The most compelling reasons for the immediate denture prescription are that a patient does not have to go without teeth and that there is no interruption of a normal lifestyle of smiling, talking, eating, and socializing.

Disadvantages:

1) Increased complexity of clinical procedures.
2) No possibility of 'Try-in" of the anterior teeth to get the patient's acceptance for esthetics and phonetics.
3) Increased treatment time and cost.
4) Subsequent relines, rebases or remakes are necessary in a short period of time.
5) Increased patient discomfort

6) There is potentially less retention.
Post-placement adjustments are more numerous than with conventional complete dentures

Indications:-

1-Hopless remaining teeth (caries, periodontal diseases or malocclusion)
2-Educated patient with daily social activity (doctors, lawyers and teachers).
3-patient with stable health condition.
4- Patient don't mind some additional visits or cost.
The best patient for immediate dentures is the philosophical type. Their motivation for denture is the maintenance of health and appearance, and they accept replacement of natural teeth that can't be saved as normal procedure.

Contraindications:

- Patients with general medical conditions which make them poor surgical risks such as cardiovascular diseases or other systemic abnormalities.
- Patients with acute infections which may require surgical drainage.
- Patients with a limited mental capacity or who are emotionally disturbed and uncooperative.
- Patients with neurologic or psychological conditions.
- Patients who have undergone radiation therapy should not be considered for immediate dentures because of the danger of osteoradionecrosis.
- Patients with limited or no neuromuscular control.
- Patients with a severe gagging reflex. Conditioning of such patients with a training appliance, such as a mouth guard, is indicated before the teeth are removed

Types Immediate Dentures:

1. Immediate interim denture:

A temporary dental prosthesis constructed to replace the lost dentition and associated structures of the maxillae and /or mandible, and inserted immediately following removal of the remaining natural teeth (Complete clearance), i.e. the denture is placed at the same appointment of extraction.

- *It is used for a short interval of time for reasons of esthetics, mastication, occlusal support, or convenience;*
- *it is worn only during the healing period until more definitive prosthetic therapy can be provided .*

2. *Immediate transitional denture:*

A Temporary partial denture to which artificial teeth are added one or two at a time as natural teeth are lost until it finally serves as a temporary complete denture. A transitional denture may become an interim complete denture *when all of the natural teeth have been removed* from the dental arch.

3-*Immediate Conventional Complete denture.*

A denture placed immediately after the extraction of the remaining 6 anterior teeth, the posterior teeth having been removed 6 weeks prior to making the dentures.

3. *Immediate Definitive cast partial denture.*

4. *Diagnostic Immediate denture:*

- Used to diagnose a patient's problem.
- The posterior segments consist of flat occlusal blocks made of plastic resin.
- Indicated for patients with advanced periodontal disease.

Also immediate denture can be classified into:

I – Immediate Dentures without Surgery (without Alveoloplasty)

1. Socketed (Open-face) denture
2. Flanged denture without alveolectomy

a.Complete flange b. Partial flange

II – Immediate Dentuers with Surgery (with Alveoloplasty)

3. Flanged denture with alveolectomy

a. InterSeptal alveolectomy b. Radical alveolectomy

III- Delayed immediate denture

IV- Controlled immediate denture

Immediate Dentures without Surgery (without Alveoloplasty)

Example: Immediate denture for upper anterior teeth:

1. *Socketed (Open-face) denture*

- In this type the teeth are extracted and no more surgery is performed.
- There is no labial flange due to insufficient space for a labial flange or due to presence of undercuts anteriorly.
- The anterior teeth extend a few millimeters into the labial aspect of the sockets of their natural predecessors

Indications:

1. Sufficient retention can be obtained from the rest of the denture-bearing area. So it is used in the upper and not recommended for the lower jaw.
2. deep undercuts are present on the anterior labial and buccal residual ridges
3. High lip line and an active upper lip would expose an unaesthetic labial flange
4. minimal amount of surgery is considered desirable.

Contraindications:

(1) periodontal disease exists with a substantial amount of bone loss which makes an acceptable cosmetic effect difficult.

(2) an anterior fixed partial denture has been worn resulting in an uneven contour of the anterior residual ridge

2.Flanged denture

• It is indicated in cases having sufficient available space to accommodate a labial flange without giving the feeling of excessive lip fullness.

• On replacing the plaster teeth by artificial ones, either one tooth is removed each time, or removes all teeth on one side of the arch, keeping the more acceptable side as a guide for the arrangement of artificial teeth.

2. *Flanged denture without alveolectomy*

a.Complete flange b. Partial flange

the presence of a flange gives better protection to the sockets from food and trauma and thus assists more rapid healing. It may be possible to use this type of denture when there has already been considerable loss of supporting alveolar bone following periodontal disease.

a. Complete flange:

indications

(1) there is no large anterior bony undercuts

(2) normal lip line and lip activity

(3) There is bone loss around periodontally involved teeth

Contraindications

(1)*pronounced undercuts are present in the anterior labial region of the alveolar residual ridge.*

(2) *fullness of the lip would produce an unaesthetic result.*

b. Partial-flange:

The extension of the shortened or partial flange is just beyond the maximum contour of the alveolar process, to a point where the undercut engaged can be accepted by

compression of the overlying soft tissues. The flange ends as a knife edge between the gingival margin and the vestibular sulcus.

II – Immediate Dentuers with Surgery (Alveoloplasty)

3. *Flanged denture with alveolectomy*

Indication

- *Where there is marked protrusion of the upper alveolar process, both appearance and denture function can be improved by reshaping the alveolar bone at the time of extraction. This advisable when the patient has a short upper lip.*

Flanged denture with alveolectomy

a. InterSeptal alveolectomy

The interdental septa are removed after the extraction of the teeth and the outer cortical plate is then collapsed lingually onto the inner plate. This reduces the labial undercut, creates sufficient room for a complete labial flange and at the same time reduces the size of the sockets that have subsequently to be filled with new bone.

Advantages:

1. No cortical bone is removed and post-surgical resorption is reduced.
2. Surgery is less traumatic than radical alveolectomy.
3. Less interference with facial form.

Technique:

- after extraction of six anterior teeth a bone rongeur is used to cut a V shaped wedge from the labial cortical plate distal to the canine on each side
- the bony septa are then removed using bone rongeur
- a chisel is inserted deep in the sockets and with the help of a mallet, knocks are applied with the chisel edge directed towards the labial cortical plate
- hand pressure is applied to the labial cortical plate towards the palate cortical plate
- excess soft tissue is trimmed and the wound is sutured using 000 black silk suture
- immediate denture insertion and patient instructions are the same

b. Radical alveolectomy

Indications:

a. Prominent premaxilla e.g. in patient with an Angle Class II
b. Patients who have a short and thin upper lip and a prominent labial alveolar ridge
c. limited anterior interalveolar space and deep vertical overlap.
d. when diametrically opposed alveolar undercuts are present.

Technique:

1-first extraction of the six anterior teeth is carried out

2- A mucoperiosteal flap is reflected by making two inclined incisions distal to the canines

3- using bone rongeur the labial alveolar plate of bone is cut off

4- the bony septa are cut off using a side cutting rongeur

5- A bone file is used to trimmed away any remaining sharp edges

6- the flap is repositioned and excess soft tissue is trimmed

7- suturing of the flap is carried out using 000 black silk suture

8- the immediate denture is inserted in the patients mouth after being lined with tissue conditioning material

9- the patient is instructed not to take off the denture till the next appointment 24 hours later

10- a suitable antibiotic is prescribed and the patient is instructed to make cold fomentation to minimize the hematoma formation

NB: for both techniques of immediate dentures with Alveoloplasty a construction of a transparent acrylic surgical template over a duplicate cast of the reduced one is helpful in detecting areas that requiring future surgical modification before suturing

III- Delayed immediate denture

- *It is inserted after one or two days of teeth extraction.*
- *It can be used to replace posterior and anterior teeth at the same time.*

Indications:

a) *Where there is pathology (large cyst) extensive surgery*

b) *Where many teeth have to be extracted with hospitalization*

V- Controlled immediate dentures (Two-step):

All the patient posterior teeth are extracted, and the patient is allowed to wear an interim partial denture until healing is complete, and the patient become accustomed to the denture treatment.

Explanation to the Patient Concerning Immediate Dentures:

1. They do not fit as well as complete dentures. They may need temporary linings with tissue conditioners and may require the use of denture adhesives.
2. They will cause discomfort. The pain of the extractions, in addition to the sore spots caused by the immediate denture, will make the first week or two after insertion difficult.
3. The esthetics may be unpredictable. Without an anterior try-in, the appearance of the immediate denture may be different from what you expected.

4. Many other denture factors are unpredictable such as the gagging tendency, increased salivation, different chewing sounds, and facial contour.
5. immediate dentures must be worn for the first 24 hours without being removed by the patient. If they are removed, they may not be able to be reinserted for 3 to 4 days. The dentist will remove them at the 24-hour visit.
6. Because supporting tissue changes are unpredictable, immediate dentures may loosen up during the first 1 to 2 years , or 4- 6 months depending on the no. of teeth and their location

Immediate complete denture construction

1-One step immediate complete denture:

In some cases it is necessary to fit immediate dentures without the prior extraction of the posterior teeth e.g. when the anterior teeth are causing pain or are excessively loose, or if the patient wishes to shorten the number of visits for extractions.

This method is not suitable for general practice and should only be employed if the patient can be treated in a hospital or nursing home.

Procedure for construction:

1-Impressions of both jaws are taken in hydrocolloid, care being taken to secure a good reproduction of the sulci.

2-The resulting casts are mounted on an articulator by means of a wax inter occlusal record.

3-Duplicates of these casts are made for reference when setting the teeth.

4-The teeth are removed from the cast and the ridge is trimmed, duplicates of these casts are made and on them clear acrylic templates are prepared.

5-The artificial teeth are set up and the denture cured and completed with normal flanges.

6-The patient is admitted to hospital, the teeth removed and the ridges trimmed with the aid of the templates, and the dentures inserted.

7-This technique gives remarkably successful results, its main drawback being that the rapid resorption renders the dentures and become ill fitted after a few weeks, and two times relining are usually necessary within the first three months.

2- Two steps immediate complete denture

The immediate complete denture is constructed two months after extraction of the posterior teeth and inserted at the time of extraction of the anterior teeth.

Complete immediate denture insertion usually follows a two stage surgical approach:

1-Posterior teeth are first extracted leaving only two opposing posterior teeth bilaterally as centric stops to maintain vertical dimension of occlusion.

2-Two months waiting period is allowed for healing of the extraction sites and to allow time for bone remodeling.

3-The plaster teeth are broken from the cast and a complete immediate denture is prepared.

4-Anterior teeth are then extracted and the finished denture is immediately inserted.

5-Immediate denture may either be a single denture or both upper and lower dentures. When both dentures are proposed, it is advisable to construct them simultaneously.

Clinical Steps for immediate denture construction (two steps)

Procedures for construction:

1- **Diagnosis and mouth preparation**-Good oral hygiene is essential before starting any prosthodontic treatment.

❖ *Patient's s systemic condition*.-

it is very important to check the general health of the patient because multiple extraction may not be tolerated by all the patients, that's why patients with uncontrolled systemic diseases should not be included in this, type of treatment. Patients under medical control and do not interfere with the steps of denture construction including several teeth extraction with or without some surgical corrections can be included, medical consultation is advisable.'

❖ *Full dental history* must be recorded in the case sheet.

❖ *Periodontal condition* of the remaining teeth must be assess, this must include teeth mobility, measurement of the 'pockets; because this .might affect surgical step of the treatment course. Severe case of periodontal disease may suggest some surgical correction after extraction to have well contoured residual ridge covered with firmly attached mucosal tissue. Periodontal condition may give a primitive assessment about the , bone remodeling sl1bsequ~nt to the surgical phase.

❖ *Full teeth charting*, teeth my help in retention as a PD or over denture abutments must be determined, any soft or hard tissue correction as frenal release or bone reduction must be included after good evaluation.

❖ *Radiographic examination* is essential for immediate denture patients.

- Periapical radiograph may be useful for localized area;
- OPG view give general view for both jaws in single image.

❖ *Teeth mold and shade must be recorded*, proper communication with the patient about his teeth shade and form is essential, furthermore teeth alignment and any individual variations as diastema, spacing, rotation of the teeth if the patient like to preserve same appearance or improvement could be suggested by you for better appearance. BUT it is very important to remove any premature contacts because these may interfere with correct jaw relation record, essential changes to improve

occlusal plane, midline, overjet and overbite and any other corrections that help in esthetic and functional requirements.

- *Occlusal plane adjustment* is necessary because the factors that necessitate tooth extraction are often associated with occlusal discrepancies. These also interfere with centric relation record as well as with the proper determination of occlusal vertical relation. Proper location of low and high lip lines must be determined to determine the required changes in teeth position or angulations
- *Presence of any infection or inflammation in the soft and hard tissues*. Periapical abscess, granuloma and cysts may make the· estimated tissue changes at the time of extraction and healing and remodeling process unpredictable, this may increase of the risk of unfitted immediate denture.
- *Previous prosthesis*, -if present- must be checked as an additive reference for the jaw relations or teeth selection. It also may help the dentist to explain some of treatment or correct SOlne errors.
- *In many cases of immediate denture construction, a diagnostic casts are essential*. These casts could serve a lot in the treatment plan and communication with the patient. The casts also can be used as a preextraction record .
- *All immediate denture patients must have good oral prophylaxis*, proper scaling and good oral hygiene, this will reduce post-operative edema and infection. Other treatments as restoration crown and bridges or even RPD all must be one coincidence with immediate denture planning.

In the diagnosis step; with all the collected information you have to decide type of surgical procedure, immediate denture can be constructed with one of the surgical procedure:-

1-Extraction of teeth only.

2- Extraction of teeth with alveoloplasty. In some case simple corrections may be needed at the sight of extracted teeth to improve the shape of the alveolar process in order to facilitate and improve denture objectives. In these cases surgical splint construction is important. This splint usually constructed on the master cast after teeth trimming. Cases with excessive bone correction may be end up with rapid bone resorption and unfitted denture, therefore bone removal must be conservative. Consultation with the surgeon is essential in some cases.

2- Extraction of posterior teeth

In case of complete immediate denture .Extraction of all posterior teeth except unilateral, or preferably, bilateral opposing premolars which provide a definite contact at the patient's occlusal vertical dimension as this vertical dimension appears to be acceptable physiologically as posterior vertical stop

3.Preliminary impressions

.The primary impressions are made in perforated stock trays with the alginate irreversible hydrocolloid impression material to obtain study cast.

Fabrication of custom tray

4. 2ndFinal impression

a. Single Impression Technique

.Autopolymerizing acrylic resin custom trays are made over the diagnostic cast with awax spacer covering anterior teeth and posterior edentulous area. And with proper Stoppers.

.The tray is border molded, .then the rubber base impression material is used to record all areas in one impression.

.The impression is poured in stone:-Single tray with modeling compound and rubber base most commonly used. Then use wax to block out large interdental embrasures.

Perforate the custom tray for the mechanical retention of alginate.

Single tray with alginate is only used when considerable tooth misalignment or great mobility present.

b. Sectional impression Tech. (two steps tech.,

1. .An acrylic resin special tray is constructed, covering the
2. edentulous area Posteriorly and resting on the lingual
3. surface of the remaining anterior teeth
4. .Tray is border molded
5. .Impression is made with zinc-oxide / E paste
6. .Overall alginate impression is taken in stock tray

.Indications of this tech.:

* Very divergent teeth
* Severe ridge Undercuts

C. Campagna Impression Technique:

It uses a special tray with labial flange to take the final impression.

Then over all alginate impression with stock tray

The main advantage of this tech. is the more accurate impression of the labial vestibule.

A custom tray border molded with impression compound, a rubber base impression material impression of the anterior vestibule and edentulous area, reinserted, and then captured in an alginate over-impression.

5.Maxillomandibular Relation Records

.jaw relation records are made by the use of occlusion rims. The occlusion rim covering the edentulous area is made the same, but the record base may extend onto the cingulae of the remaining teeth to provide additional support. This extension of the upper record base must not interfere with normal occlusion of the lower natural teeth.

.The occlusion rims are the only reliable index of inter-arch distance in an immediate denture.

6.Selection of teeth:

The remaining natural teeth guide in the selection of teeth, direct measurements will help in duplicating the natural teeth.

7.Arrangement of anterior teeth can be made in different .. Ways, we have to decide:-

1- If the teeth are need to be changed in location or alignment to improve the aesthetic.

OR

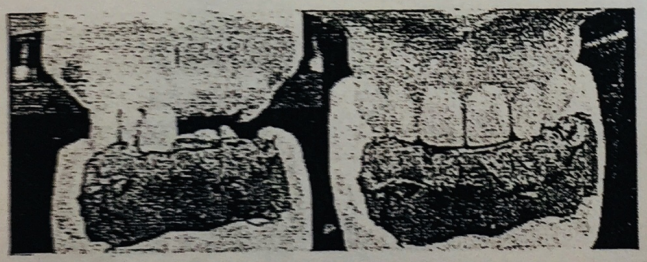
2-Tthe teeth are well aligned, aesthetically and functionally acceptable; then we can reproduce same alignment in the denture.

- First way:-

produce a labial index of the natural teeth before they are cut off the cast. The index can be produced quite simply by molding silicone putty against the labial surface of the teeth and ridge on the cast, wait till the material set, trim the cast, then the artificial teeth can be set into the index while its held against the cast preserving same teeth location.

-In this technique same teeth morphology and location is duplicated, thus consultation with the patient about own teeth alignment and morphology must be made at the time or diagnosis .

Silicone index to guide incisal edge placement



• Second way:-

Remove one tooth from the cast and immediately wax an artificial tooth into position so that the adjacent teeth serve as a guide to the positioning of the artificial replacement. Repeat this procedure alternatively.

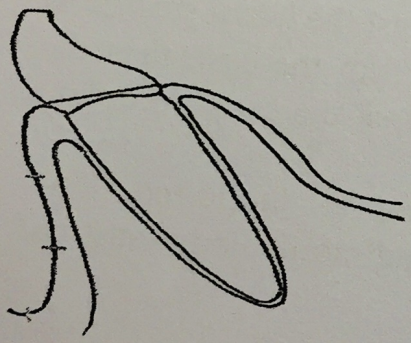
-If you decide to duplicate teeth position so you have to an index; either by using silicon impression material ; heavy body, adapted to the teeth on the cast and then used to match artificial teeth location OR use the alternative or every other method; you can use every tooth as an index to arrange same tooth but in the other side OR trim all the teeth on one side and use the other side as a reference.

8.Evaluation of the trial denture(Try-In)

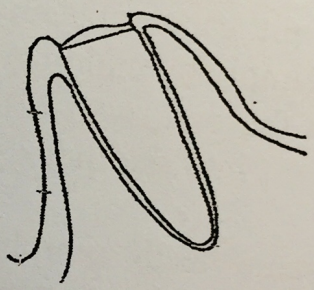
Confirmation of horizontal and vertical relationships
.Tooth shade
Steps of trimming are:- Removal of the teeth and cast preparation: The denture is constructed on a working cast which is trimmed to the anticipated contour of the ridge after surgery.

Reference lines are drown on the cast
Preparation of the cast differs according to the type of immediate denture

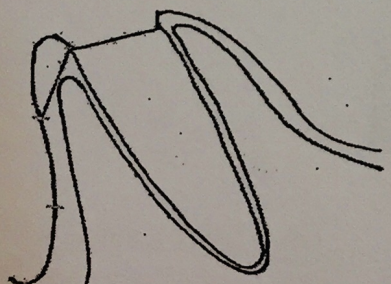
Step 1 Remove tooth at gingival level



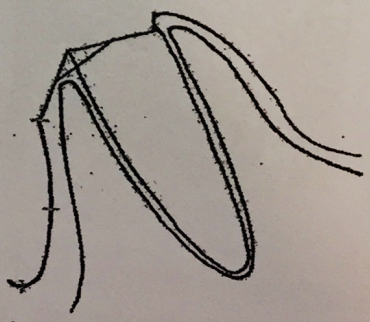
Step 2 Recess Socket 1 mm



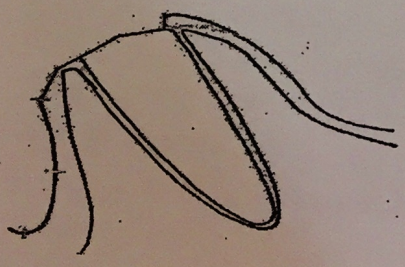
Step 3 Labial edge recess to incisal third mark



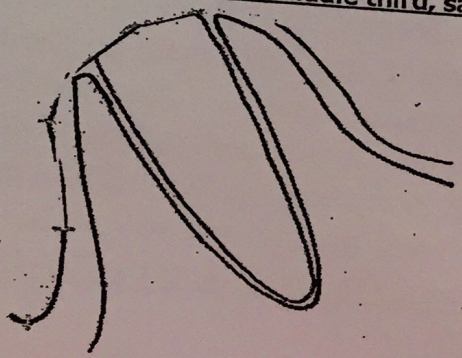
Step 4 Mid-point recess to mid-width labial cut



Step 5 Round over lingual aspect of socket



Step 6 Round off labial to middle third, sand smooth



10 Fabrication of Surgical Template

A clear surgical template duplicating the surface of the immediate denture after modification of the stone cast is used at the time denture placement as a guide for surgically shaping the alveolar process. The clear template allows the dentist to visualize the adaptation of the denture base to the residual ridge.

Blanching of the soft tissue as seen through the template indicates excessive pressure. .When the extractions and alveolectomy are being done, the surgical template can be inserted in the patient's mouth from time to time to assess if sufficient bone has been removed.

11.Surgical procedure:

12.Placement of the denture

- After completion of the surgical procedures, the patient is instructed to close against sterile gauze until the cessation of the bleeding. As soon as the patient has recovered from the immediate effects of the operation, the denture is inserted.
- Pressure-disclosing material will aid in locating pressure points,
- check the occlusion, even gross occlusal disharmonies in an immediate denture are corrected in the mouth.

Final occlusal adjustment will be delayed until all swelling and edema have subsided and the patient is comfortable.

13.Patient Instructions

The instructions should be both written and oral, and include specific information about the first 24 hours, care of the oral tissues and dentures, changes in the residual ridge, and denture maintenance.

14.Post-placement Care

.Pressure-indicating paste is used to locate pressure areas

.overextensions of the denture borders are reduced.

.The occlusion is checked for interceptive occlusal contacts.

.patient should be seen every 24hours for the first three days, then every other day for one week.

The first 24 hours

- Patient should Not to remove the dentures from the mouth during the first 24 hours,
- Patient should be reminded that the pain from extraction will not reduce by removal the denture.
- ice packs may be held on the face to combat swelling.
- eat a soft diet
- Analgesic, antibiotic, must be prescribed to patient depending on the case.

- return for a scheduled appointment.
  - 1st Adjustment must be seen after 24 hours:-
  - Remove denture 5 times per day
  - Rinse the mouth with warm saline
  - Avoid mouthwash containing alcohol

The dentures should be worn at night for the first week only, after this period, the dentures should be week only, after this period, the dentures should be removed at night.

Proper nourishment is essential to the overall treatment of the patient and must not be neglected.

• 1 st week after extraction and denture insertion:-

I-Instruct your patient to wear the denture day and night for first 7 days after extraction or until swelling reduction.

2-Remove the denture 4 or 5 times a day after the first day, and rinse the mouth with warm salt water. Do this for the first week.

3- The denture must be cleaned and rinsed after meal as early as possible and when removal and insertion of the denture is with little or tolerable pain .

•Further follow up care:-

1- 2nd week is the next call, this is depend 0 the case. Then the patient should be seen one month later, 4-6 months intervals.

2-A denture adhesive will be necessary to help hold the denture in place.

3- Relining may be necessary to achieve esthetic and occlusion corrections.

4- Frequent or periodic recall mainly for changing temporary liner, this is depend on the rate and amount of bone resorption and ability of patient to keep the liner clean

Maintenance of Immediate Complete Dentures

a.Occlusal equilibration

It is delayed for 5 to 10 days in immediate denture treatment until all swellings has subsided and the patient is comfortable. It is best done on the articulator with clinical remounting.

b. Denture reline, rebase or remake.Healing affects the denture fit

.Short term tissue conditioners

.Mid-term

–intermediate direct liners

.Long-term

–standard reline protocol

Comparisons of flanged and open faced denture :-

1.appearance of flanged denture does not altered after fitting where the appearance of open – face denture (although good initially) can deteriorate rapidly as resorption create a gap between the necks of the teeth and ridge

2. the flanged denture allows freedom in the positioning of teeth ,where, in open face denture teeth have to be positioned in the sockets of the natural teeth
*so on case of malpositional teeth we can do good alignment in flanged denture while we can not in open face type.

3. In upper denture:

a flange on an upper denture create a more effective borders seal , therefore , better retention than is achieved with an open face denture.

In lower denture:

open face denture is not usually constructed because of poor stability of lower denture during function , so flange denture is commonly used.

*so flange denture is better from the point of stability.

4.The presence of labial flange produces a stronger denture, labial flange will make the denture stiffer so the midline fatigue fracture cause by repeated flexing across the midline is reduced .so from the point of strength the flange denture is better .

5. As the bone resorbed fallowing extraction the denture become loose and a reline is required , so the presence of labial flange make it easier to add either a short – term soft lining materials or a cold curing relining materials as a chair side procedure, as the color of some reline materials is not always ideal they may be visible when used with open face denture.

6. The flange denture cover the clot completely and protect them more effectively, the flange denture exerts pressure on both lingual and labial gingiva reducing post extraction hemorrhage.

7. The consequence wearing of ill fitting denture can lead to:

If it is open face ,will produce a scalloped ridge in the region of the socketed teeth

In flange denture ,distribution the functional loads more favorably to the underlying ridge, thus minimizing bone resorption.

8. When patient have got used to an open face immediate denture there is difficulty to accept a denture with labial flange in future and patient will complain from the fullness of the lip .

If flange denture had worn from the beginning this problem does not occur.

9. When the ridge morphology produce deeply undercut area it may not be possible to fit a full labial flange unless there is surgical reduction, In this case the using of partially flange denture or open face denture is preferable when surgical procedure is contra indication.

Immediate denture can be classified according to type of restoration into:-

I- Immediate complete denture.

2- Immediate partial denture.

3- Immediate over denture.

Attachments in overdenture

Attachments are small mechanical devices, they are incorporated to provide retention and support, one part is connected to a root, tooth or implant(male part) and other part to a prosthesis(female part)

Function of attachment

1- Securing the prosthesis against forces that tend to lift it.

2- Providing periodontal support for the prosthesis.

3- Transferring the forces of the muscles of mastication from the prosthesis to the periodontium in as nearly axial direction as possible

4- Distributing shearing forces.

5-Stabilizing and/or splinting the abutment teeth

Factors affecting attachment selection

1. Available inter-arch space.
2. Crown root ratio and alignment of the roots.
3. Type of coping.
4. Vertical space available.
5. Number of teeth present.
6. Amount of bone support.
7. Location of abutments.
8. Location of the strongest abutments.
9. Whether the overdenture is a tooth supported or toothtissue-supported.
10. The type of the opposing dentition whether it is complete denture, overdenture, fixed appliance or natural dentition.

11. The maintenance problems and the cost.

12. Clinical experience and personal preference.

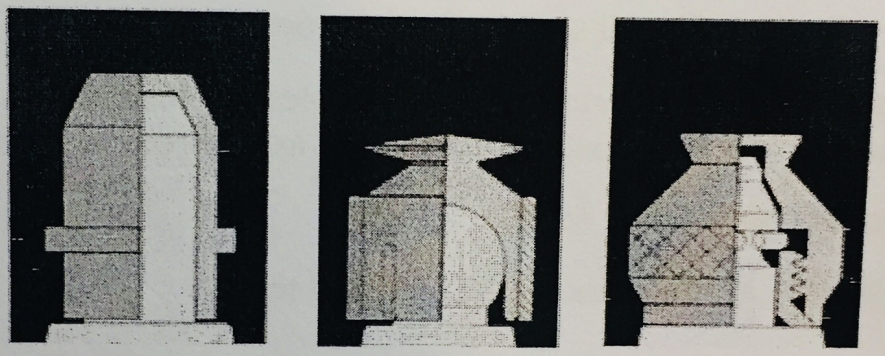
Retentive Mechanism

It is achieved by either:

1- Active retention provided by springs that fit into recesses.

2- Friction between the components.

3- Magnetic anchorage



Classification of Attachments

A- <u>Rigid attachments</u>

A retentive attachment is considered to be rigid if it is grasps the abutment tooth bodily and permits no movement between anchor and prosthesis except for rotation around the long axis of the element in case of a single tooth. Even with rigid attachment there is a minimal amount of movement, which can increase when the attachment wear.

Advantages:

1- Reduction of the load on the edentulous ridge during function and parafunction.

2- Minimum tipping of the abutment teeth when subjected to lateral forces.

Disadvantages:

Applied forces and movements of the denture are transmitted almost entirely to the abutment teeth

B- Non rigid attachments

Non rigid attachment permits rotational movements of the denture around the anchor in one or more planes, or vertical body movement's .The greater the number of the non-rigid attachments used in the same denture, the more limited will be movement of each.

Advantage: Reduced effect of tipping force on the abutment teeth.

Disadvantage:

-Greater stress on the tissues supporting the denture (Ridge resorption)

Non rigid attachments may be indicated under the following conditions:

1- When the geometric distribution of the remaining teeth is unfavorable for the stability of the denture. This can give rise to undesirable tipping and rocking movements especially if the soft tissue support is more resilient and/or less expanded than normal.

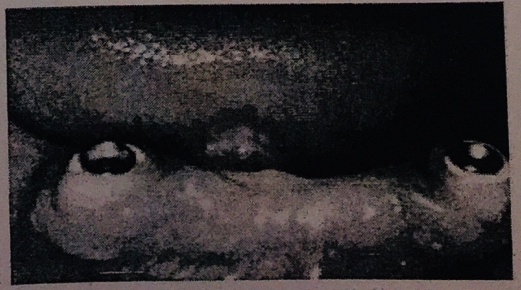
2- When only a short dowel (post) can be used to anchor the coping. If a rigid attachment were used over a short dowel, uncontrolled movement of the denture might loosen the dowel from the root

Types of attachments

A-Stud attachments: (2 types):-

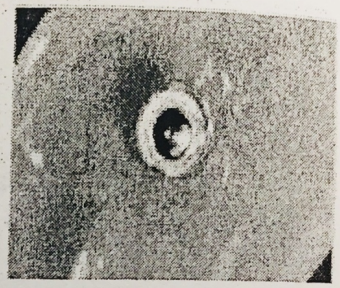
1- Intra radicular attachments. (E.g. Zest anchor attachment).





2- Extra radicular attachments. (E.g. Ceka Revax attachment).





B- Bar attachments: (2 types):-

1- Bar units.
2- Bar joints.

C-Magnet attachments.

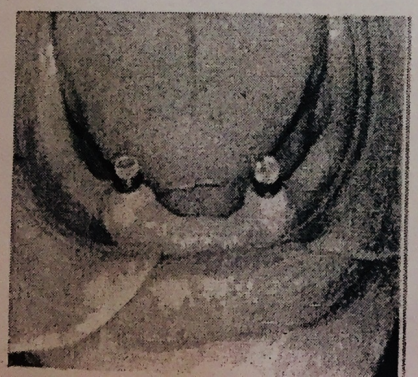
Stud attachment

•Male stud –soldered to the base which is a coping covering the prepared tooth stump
•Female housing –this is embedded in the acrylic of the OD or it is soldered to substructure in the OD
•Male and female attachments may be either resilient or non resilient

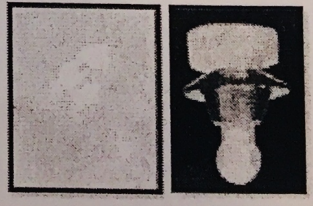
There are many systems of stud attachments:

1. Zest anchor (intraradicular attachment)

- Post prep is made within the root and the female sleeve is cemented into place
- Male portion consists of a nylon post and a ball head attachment to the overdenture as a chair side procedure
- Ideal for interim overdenture







Matrix

Advantage

1. Overcomes any space problem since the attachment is within the root structure.
2. Leverage to the abutment tooth is reduced
3. Attachment procedure is simple
4. Parallelism is not necessary if more than one tooth is used due to the flexibility of the nylon
5. No casting is required

Disadvantage

1. Caries susceptibility as no coping placed
2. Nylon stud can bend preventing seating (To correct this frequent recall) visits are necessary
3. When eating foods without the OD can cause food to stagnate in the female part.

2-Ceka Attachment (extra radicular attachment)

• Male part fixed to the tooth and has a rounded shape wider at the top and split vertically into 4 sections. They are flexible and can be compressed

• Female housing fits over this

• The attachment can also be constructed with a different type of retention male that has a space between the parts to allow both rotational and vertical movement



Patrix – metal ring

Matrix – attachment pin (split metal post)

3-Dalbo attachment

• Rigid, resilient or the stress breaker type

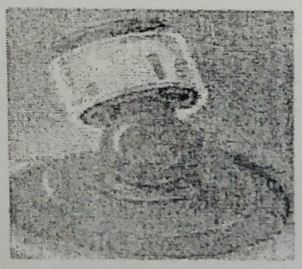
• Male part is soldered to the tooth and the housing to the base

• The rigid type has a cylindrical male unit with a rounded head

• The resilient is the smallest and the most commonly used.

• Rotational and vertical movement possible because of relief spacers between the units

• Retention in this is by the flexible arms of the female unit fitting over the undercut head of the male unit

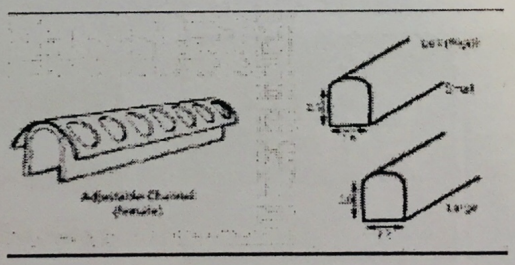


Bar attachment

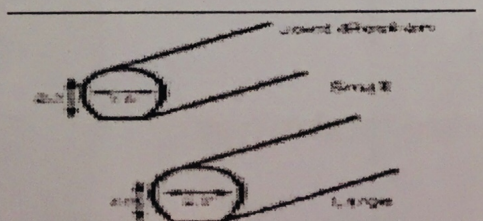
• The purposes of using bars are: – Splinting of abutment teeth – Retention and support of the prosthetic appliance.

• There are 2 types:

– **Bar units** : which are the rigid type, no movement between bar and overlying sleeve, transmits occlusal stress totally to abutments.



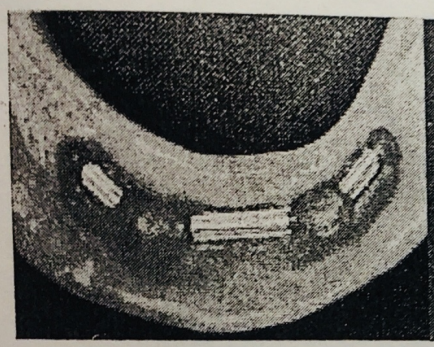
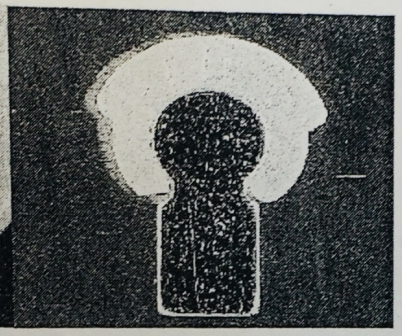
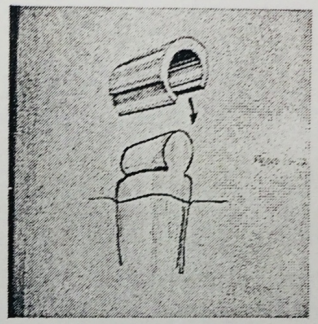
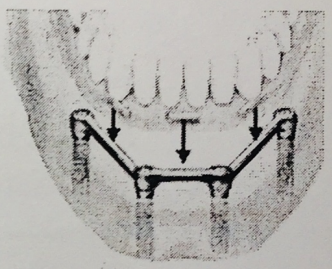
– Bar joints: which allow some movement of the rotational type. Utilizes the residual ridge for support .



There are many systems of bar attachment such as:

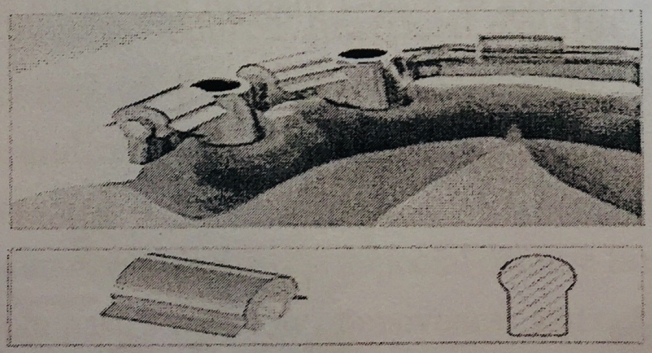
1- Hader Ba

This bar can serve either as a bar joint or a bar unit or as stud .It consist of preformed plastic bars and clips .The bar is attached to the coping wax-up and is casted with the coping. The plastic clips can be imbedded in the denture base to gain retention.

2-Ackerman clip and C.M. clip

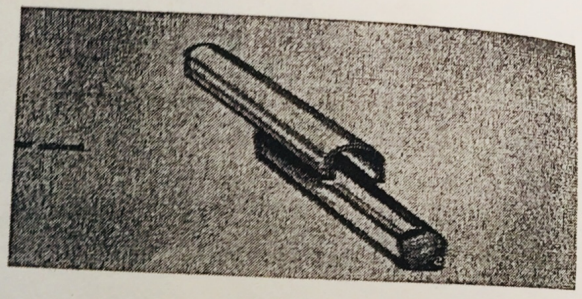
It consists of a round bar soldered to the post copings and the clip fits over the bar, It in addition has retention wings for engagement of the clip into the resin in the overdenture, spacer is supplied, so that the clip does not rest directly on the bar providing both rotational and vertical movement.



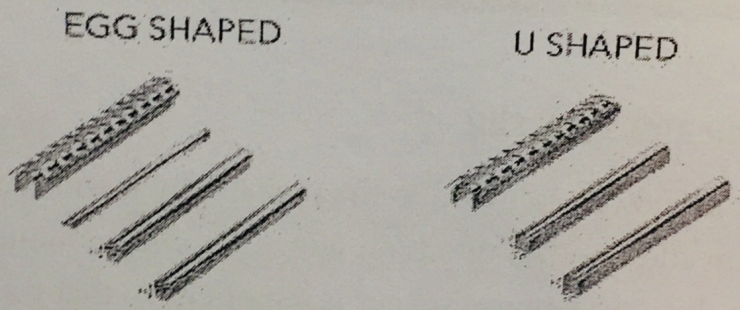


3- Dolder bar

• Bar unit: preformed bar with parallel sides and rounded top soldered to the coping , Sleeve is present in the denture bases , Retention is due to friction ,If the post of the copings cannot be made parallel to seat the soldered bar then a schubiger unit is used . Because of the parallel walls and close adaptation rotation is not possible

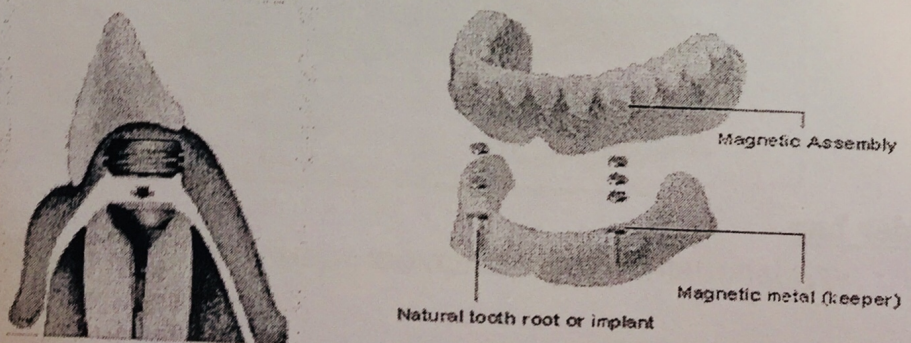


• Bar joint: – Egg shaped bar with a spacer. This allows some movement
– Difficult to adapt to tissue contour and bulky.



C-Magnet Attachments

Magnet system of cobalt - samarium magnet built into the denture base and a magnetisable dowel -coping or keeper plate of palladium cobalt- nickel alloy into the abutment teeth



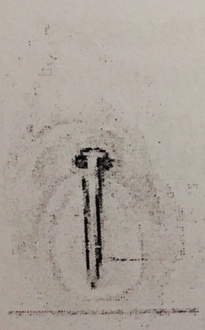
O-Ring attachment

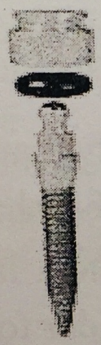
They are doughnut shaped, synthetic polymer objects that possess ability to bend with resistance and then return back to their original shap.The

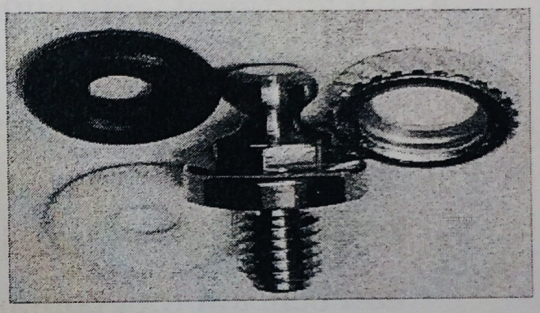
O-ring attaches to a post with a groove or undercut area.

Advantage

- Ease in changing the attachment.
- Wide range of movement.
- Low cost.
- Elimination of time &cost of a superstructure of prosthesis.





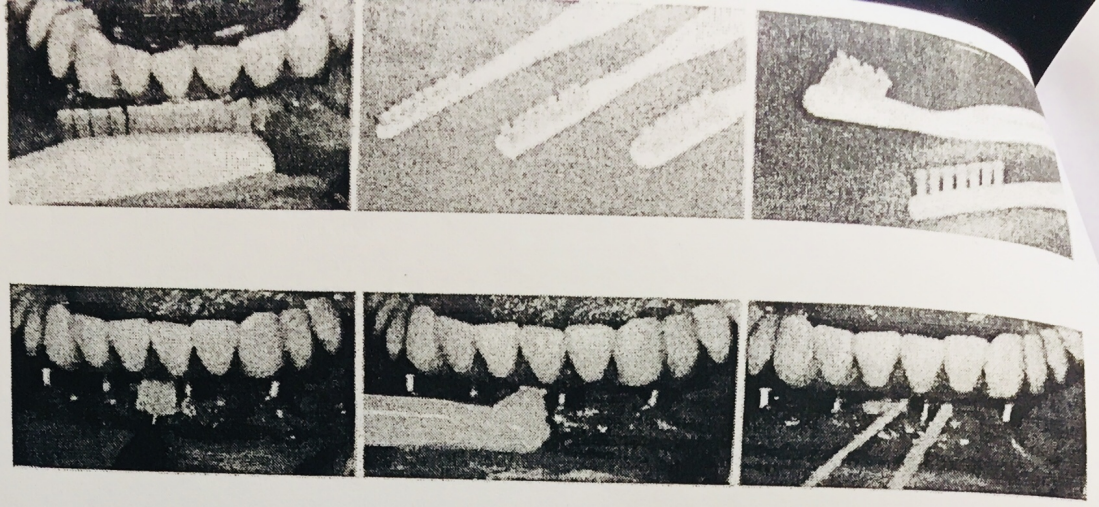


Oral Hygiene Instructions

- Motivating and instructing the patient in the care of the overdenture is of the extreme importance for its long term success
- Learned during the preliminary treatment phase, the oral hygiene procedures practiced by the patient following placement of the overdenture should be an uninterrupted continuation of the home care measures.

Overdenture care

- 1- Ordinary toothbrush or a special denture brush.
- 2- Tooth pastes with low abrasiveness and non-alkaline soaps.
- 3- Denture cleansers (mostly peroxide based) are a useful adjunct.
- Candidacies can be treated by immersing the denture in a 0.2%chlorhexidine solution for 10-15 minutes every day



Care of abutment

A-mechanical aid

- All abutment teeth with or without root coping must be cleaned on all sides.
- All exposed root surfaces and gingival area should be brush again with an inter proximal brush.
- Dental floss is used only to clean under interdental bars and beneath root coping that are solder together.

B-chemical aid

Fluoride in gel
Fluoride in a 0.025% solution can also be used as a daily rinse.





Chlorhexidine:
0.1-0.2% solution as a daily rinse
gel to be applied inside the denture base or the female attachment.

Prosthodontics follow up care: - to correct

-Occlusion (remounting records).
-Base (relining).
-Pressure spots.
-Bar (loose screws).
-Bar clips (broken, loose).
-Female retainers and clips remounted with acrylic resin.
-Signs of wear

Lec. No.

Over denture

The overdenture: is any removable dental prosthesis that covers and rests on one or more remaining natural teeth, the roots of natural teeth, and/or dental implants; a dental prosthesis that covers and is partially supported by natural teeth, natural tooth roots, and/or dental implants.(GPT. 9, 2017). The overdenture is also called overlay denture, overlay prosthesis or super imposed prosthesis.

The important goals of overdenture:

1-Maintains teeth as part of the residual ridge

- More support
- Withstands more occlusal load
- Retention improve

2-Decrease in the rate of bone resorption .Alveolar bone exists as a support for teeth

3- Retaining the proprioception

An increase in the patient's manipulative skills in handling the denture.

Indications of Overdenture.

1-few remaining teeth unsuitable for fixed or removable partial dentures.

2- Remaining teeth present with unhealthy periodontal condition.

3- Patients with class II or class III Angle's classification - Esthetics & masticatory function improved.

4- Patients presenting abnormal jaw size large maxillary or mandibular bone defects.

5- The construction of over-denture is an alternative line of treatment to single dentures opposing few natural teeth.

6- Patients presenting congenitally missing teeth and congenital defects as cleft palate, microdontia, amelogenesis or dentinogenesis imperfecta or partial anodontia.

Contraindications of Overdenture:

1- Poor oral hygiene.
2- Inter-arch space inadequate to accept the denture and the abutments.
3- Mentally and \or physically handicapped.
4- Cost and time considerations.
5- When other treatment modalities promise superior results.

6- Lack of patient acceptance.

Advantages of overdenture prosthesis

1. Preserving the remaining residual ridge by decreasing the rate of bone resorption.
2- Preservation the abutments as part of residual ridge to gain support.
3. Preserving the response of proprioceptive exist in the periodontal membrane of the abutment tooth.
4- The modified teeth provide a definite vertical stop for the denture base
5-Horizontal and torque forces are minimized.
6-Stability and support are increased
7-Patient acceptance and Psychological Benefits
8-A Simple Approach to the Problem Patient.
9-fewer post insertion problems
10- Convertibility& effective management.
11-Periodontal Maintenance.
12- Provide retention through the attachments.

Disadvantage of overdenture:

1. The susceptibility of the overlaid teeth to caries is high
2. Periodontal disease of the retained teeth
3. Bony undercuts of the alveolar ridge are often found adjacent to retained teeth over contoured (bulky denture) or under contoured flanges especially in canine eminence.
4. Encroachment interocclusal distance beyond the denture space.
5- Overdenture construction is time consuming and expensive.

Overdenture Classification:*Overdentures can be classified into:*

1-tooth supported

A complete or partial removable denture supported by tooth or retained roots that is intended to provide improve support, stability and tactile and proprioceptive sensation and to reduce ridge resorption. The tooth -supported over denture is also called overlay denture, telescopes denture and biological denture are among the many terms used to define the tooth-supported complete denture.

2-implant supported

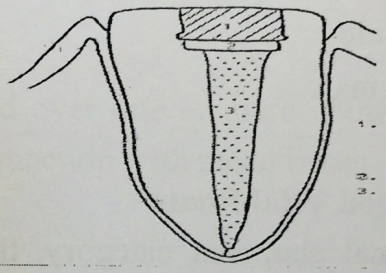
The denture appears like traditional prosthesis.however, that part of the denture overlying implants is modified to retain various attachments that receive implant extentions projecting above the gum.

Classification of tooth supported overdenture Based on the method of abutment preparation

1. Non coping abutment

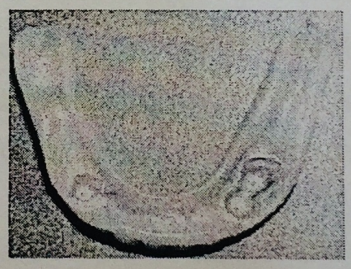
- The tooth is reduced to a coronal height of 2 to 3 mm
- The crown is contoured to a convex or dome shape
- The tooth is endodontically treated and filled with amalgam or composite restoration





2. Abutment with coping preparation

- A coping is a cover for the exposed tooth surface.
- Cast metal copings with a dome shaped surface and a chamfer finish line at the gingival margin





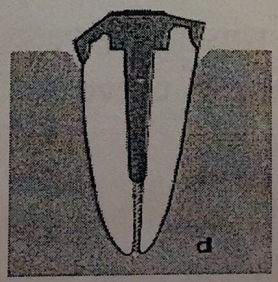
There are two types of copings:

A. Short copings

B. Long copings

A- Short cast copings

2 to 3 mm long (cast coping has a post is fitted to endodontically treated canal).



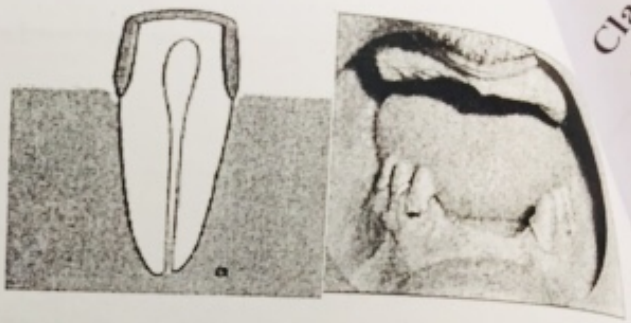


B-Long cast copings

- 5 to 8 mm long abutment
- Endodontic treatment is not a must (abutment is prepared

Conservatively to prevent pulp involvement to receive the cast)

- Greater level of osseous support.

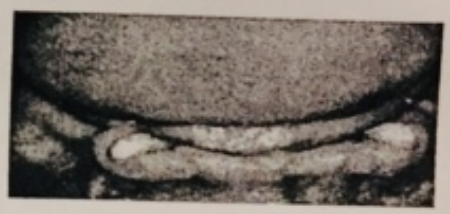


3- Abutments with attachment

- ❖ Attachment is small precision device
- ❖ Most attachment are secured to the abutment by cast coping.
- ❖ Objective to improve retention of denture base.
- ❖ Consisting of 2 parts
  - Male
  - Female

4. Submerged Vital Roots

This additional abutment category, this method is innovative attempt to overcome some problems associated with the more conventional overdenture abutments included caries, gingivitis, periodontitis and the need for endodontic therapy. This method included vital roots are transected and reduced to 2mm below the crestal bone and covered by mucoperiosteal flap. The disadvantage of these method dehiscences over the retained roots and pulp pathosis.



5-Abutments with telescopic crown

- o Abutment teeth are either vital or endodontically treated &contoured to tapered configuration.
- o Tapered metal copings constructed &cemented over abutments
- o Denture constructed with metal crowns having veneered facings.
- o Indicated 1) unparalleled abutment 2) uneven spaces between abutments 3) useful for obturaters
- o Advantage increased retention and stability
- o Disadvantages bulky crowns. .

Classification of over denture based on the type of the over denture

1. Immediate overdenture

The remaining teeth are reduced to accept the overdenture (on the cast), the overdenture are constructed prior to the preparation of abutment teeth and is inserted after the preparation.

2- Transitional or intermediate overdenture

Used for patient in transition or preparation phase until permanent overdenture constructed or patient with old partial denture and add new artificial teeth using self cure acrylic resin.

3-definitive overdenture

Conventional complete over denture constructed over one or more abutment teeth. Could be made entirely of acrylic resin or in conjunction with metal bases .

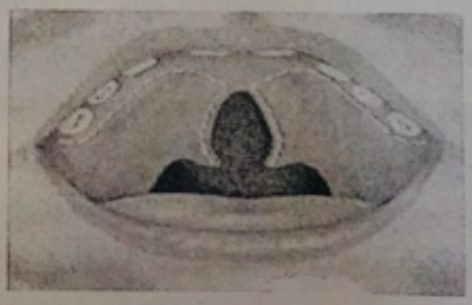
Uses of overdenture concept in other areas

The overdenture approach has applications besides the obvious replacement of complete denture therapy or extensive restorative dentistry

Congenital and acquired defects:

Patients presenting with such anomalies as cleft palate microdontia, amelogenesis imperfect etc…the overdenture application can afford Avery workable and relatively simple solution to patients with selected problems. The important benefit is that the technique is totally reversible.

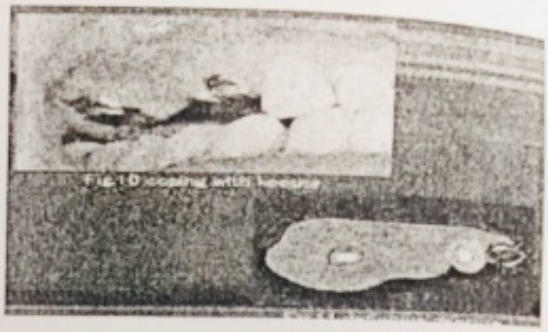




Partial overdenture

The use of an overlayed tooth that might otherwise be extracted to give posterior support to distal extension base or to provide anterior support for a large anterior supply on a partial denture renders obvious support advantage.





Sequence of Treatment of Patient Who Need an Overdenture

A-Assessment of the patient

1. History (general and oral)
2. Clinical examination (visual and digital examination, radiographic examination and study model of the arch

B-Treatment plan

Evaluation the abutments

1-Periodontal status

2-Endodontic considerations

3-The number and position of abutment teeth in the arch

1-periodental status

- Minimum mobility
- Have acceptable bone support, 5-7mm
- Amenable to periodontal therapy

2--endodontic consideration

The tooth must be treated endodontically to allow for sufficient reduction of clinical crown ideally patient with single rooted teeth with only one canal are the best candidate although multirooted teeth can also be used.

3-the number and position of the abutment teeth in the arch

In maxillary arch incisors are used, at least one tooth per quadrant should be present, ideal is 2 teeth per quadrant. The stress is distributed over a rectangular area, A tripod approach can also be used, most commonly used teeth in the mandible for abutment Canine ,reasons – Position, Large surface area, The Canine response, Time period of retention of the tooth, less susceptibility to periodontal breakdown, fewer anatomical and positional difficulties .periodontal treatment include.

Abutment Preparation

1-Simple Tooth Modification and Reduction

The teeth are reshaped to eliminate undercuts and to reduce the vertical height. This technique is often used in partially anandontic patient or in patient with severs abrasion of teeth.

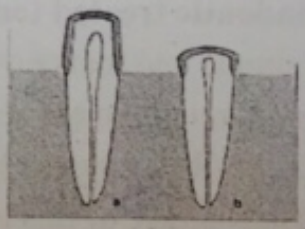


Indication:

1. Good oral hygiene with low caries index
2. Vital pulp
3. Partially anadontnic patient
4. Sever abrasion of teeth
5. Sufficient interocclusal distance.

2- Tooth Reduction and Cast Coping

Cast copings are made after reducing the teeth to prevent sensitivity or as caries control. Endodontic is not done on these teeth; this technique is used when there is adequate bony support and good periodontal prognosis.

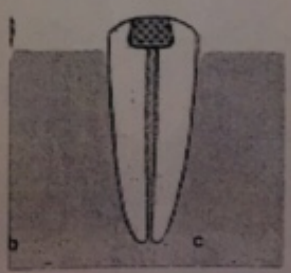


Indication:

1. Adequate bony support
2. Good periodontal prognosis
3. Adequate interocclusal distance.

3-Endodontic Therapy and Amalgam Plug

It is indicated when there is normal coronal height to the teeth and normal interocclusal distance with little or no loss of vertical dimension, endodontic therapy to the abutment then reduced (1-2) mm at gingival level to receive an amalgam type restoration.



4-Endodontic Therapy and Cast Coping

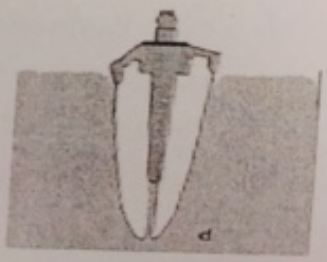
Shallow dome shape with the margin slightly supra-gingival. Recurrent decay on the exposed dentin when there is a history of carious involvement. The retention is gained from a short post that is placed within the root canal.





5- Endodontic Therapy with cast coping utilizing some form of attachment

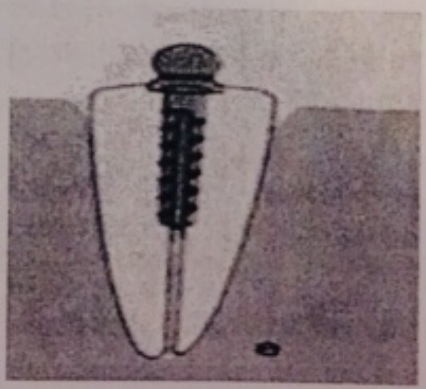
Over denture retained by attachments offer the patient the idea of afixed removable bridge instead of a denture. The abutments are prepared as in short-coping but with long intraradicular post to prevent root-coping dislodgment. Two attachments are enough to retain a denture's third attachment add unnecessary complexity and weakens the denture.



6-Endodontic treated tooth with prefabricated retentive element

It is a simple and inexpensive way to temporary fixation of overdenture.
(Spherical retentive element attached to a threaded post).
Ex. (Dalbo-Rotex system).
The disadvantage of this type is that the omission
Of a protective coping increases the risk of carious destruction and root fracture.





Impressions of the Abutment Teeth

One –stage technique with supporting element

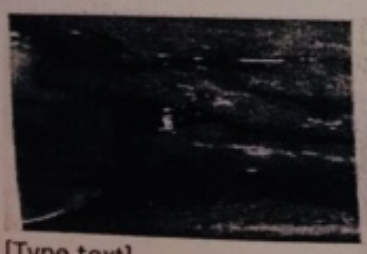
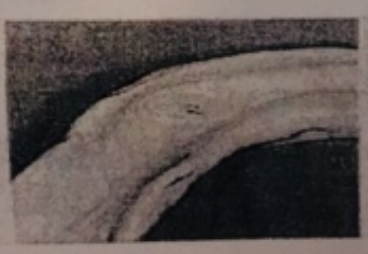
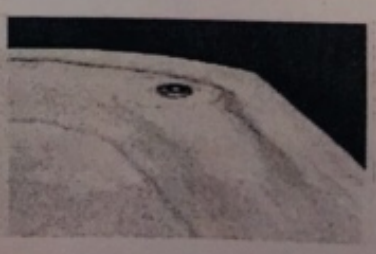
For designs that rest on abutment teeth without root copings, the full-arch impression is made as soon as the abutments are prepared. When root copings without retentive elements, the impression is made after final cementation of the copings, the full arch impression is made in a custom try similar to one for conventional complete denture. It covers the entire ridge except for any undercut areas near the abutment teeth that could not be utilize for the future denture base any way. The impression is made using Zinc oxide-eugenol paste or elastomer in the same manner as in the edentulous arch.





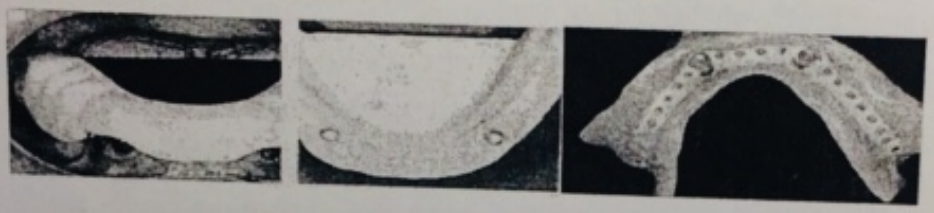
One -stage technique with existing retentive element

Asingle step full arch impression in Zincoxide-eugenol paste or elastomer the materials used for overdenture that will rest on Pre-existing retentive elements Transfer matrices are set in place on the involved retentive elements and picked up in the impression. this is make it possible to incorporate retentive elements analogs in the working cast, used custom tray similar to these used for complete denture ,the try must touch neither the root coping nor the transfer matrices.

Record base

The only difference in the construction of the record bases for tooth –supported overdenture and conventional dentures is the incorporation of the metal bearing in the record base. The shape of the record base must correspond to that of the future overdenture,i.e., it should not cover the facial marginal gingiva in the abutment region.



Denture Base designing

Criteria for Designing the Base

- Not unnecessarily promote plaque accumulate
- Not mechanically traumatize the marginal gingival.
- Not impede the performance of good oral hygiene.
- Not interfere with normal function of the tongue, lips and cheeks.
- Not interfere with esthetics or speech

Designs that leave the periodontium uncovered

☒ The base does not cover the gingiva, and the artificial teeth are prepared to fit directly upon the roots or the dowel copings

1- Bases that are circumdentally open

2- Bases that is facially and proximally open.

☒ Temperatures in the gingival sulcus are significantly higher under closed bases that cover the gingival margin than with open designs. Gingival reaction was always most severe where the denture base covered the gingival margin and least severe in uncovered gingival margins.

Basic rules of overdenture base design

1. Cover as little of the marginal gingiva as possible
2. Border the proximal spaces with metal.

3. The greater the number of abutment teeth and the better their prognosis, the more open the construction may be.

Advantages of a base designed that it does not cover the gingiva

1. precludes direct mechanical trauma
2. Reduce plaque retention around the abutments.
3. it possible to clean the proximal surfaces of the root coping with interproximal brushes with the prosthesis in place
4. prevents a suction effect combined with inadequate coping shape and poor oral hygiene , would lead to hyperplasic proliferation (suction hyper plasia)
5. prevents undesirable vacuum retention in maxillary overdentures with retentive attachment

Disadvantages

1. increased risk of fracture of the base
2. Unfavourable spatial relationships that do not permit extensive proximal openings
3. Esthetic considerations
4. increased food impaction in the open proximal spaces
5. Speech problems such as sigmatism
6. Poor prognosis for the abutment teeth, making probable an early conversion to a complete denture

Circumdentally opened design

Advantages

1. Possible to clean the abutments without removing the denture.
2. The base cannot traumatize the gingiva around the abutments.
3. minimal extension of the base

Disadvantages

1. very complex
2. The risk of fracture is greater
3. The possibilities are limited for modifying and adding to the denture when abutment teeth are lost.

Indications

- abundant space over the abutments
- a good prognosis

Facially and proximally open design

Have enough rigidity only if they incorporate custom cast reinforcing frameworks.

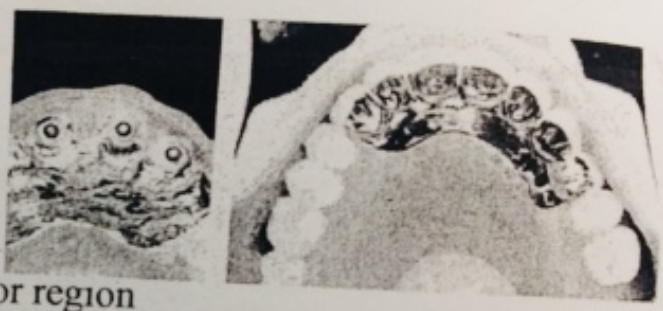
Advantages

- less involved technical construction,
- the reduced risk of fracture .

- the ease of modification when an abutment is seldom causes any problem with phonation or food retention.

Disadvantage

1. difficulty in cleaning
2. The greater extension of the denture base (psychological disadvantage)



Indications

- Poor prognosis
- speech problems
- extensive tissue loss in the anterior region
- unfavorable spatial relations

2-Implant supported overdenture

An implant retained overdenture is an alternative form of treatment to the fixed-implant prosthesis. The denture may attach on a cast bar fixed to abutments, or it may attach to individual abutments.Patient can remove the overdenture for cleaning. Due to an increased awareness of the variety of clinical situations, bone density, biomechanics, and patient's desires, and an ever growing number of patients benefit from additional retention and support through the help of implant supported overdentures.

Type of implant overdenture

1-implant-retained and tissue-born overdenture

It depends primarily on residual alveolar ridge for support. The implants will provide support in the area of the arch in which they are placed when loading is directed over them, this type need less number of implant (depending on the quality and quantity of the bone for maxilla and mandible)

- 2-4 implants -------for mandible
- 3-4 implants------for maxilla

2-implant –retained and implant –born overdenture

It does not depend on tissue support but depended on implant to bear the total occlusal loading. This type requires the use of sufficient number of implants to accommodate the load placed on the prosthesis.

The minimum number of implant required:

- ☒ 4 implants ---------- for mandible
- ☒ 6-8 implants----------for maxilla

Indication of Implant supported overdenture.

1. The patient's general health allows only a short surgical procedure.
2. Residual ridge will permit the insertion of at least two implants
3. Patient has no exaggerated, unrealistic expectations for success.
4. Patient has worn removable dentures previously
5. Economics: the patient is either unwilling or unable to bear the expense of a fixed reconstruct.

Contraindication:

1) Systemic conditions on.
2) Inadequate bone substance for placement of at least two implants.
3) Unrealistic patient expectation.
4) Mental disorders.
5) Pregnancy
6) radiation to the implant site
7) Unrealistic patient expectation
8) Improper patient motivation

Consideration that determine the type of implant supported overdenture

1- Patients desire.

2- The quality and quantity of the bone in the arch.

3- The opposing occlusion.

4- The amount of inter-arch distance.

5- Economic considerations.

The removable implant supported denture may present certain advantages over fixed implant prosthesis such as:

1) Decreased costs associated with fewer implants.
2) Easier access for oral hygiene procedures.
3) Improved facial support via denture flanges.
4) Improved esthetics and phonetics, particularly in the maxillary arch

Complications in complete denture wearers

In this lecture, we stress the importance of planning a programme of recall appointments after fitting complete dentures, to ensure that the tissues are not being damaged and that the dentures are functioning efficiently and comfortably. A recall visit also gives the patient an opportunity to seek advice over any concerns.

To reduce the risk of mucosal damage and bone resorption in complete denture wearers, a check should be made every year. It is important that the patient is not under the mistaken belief that once the artificial substitute for the natural teeth has been provided there will be no further problems, and no need for further maintenance.

Epidemiological studies of edentulous population have shown that most patients with complete dentures have pathologic tissue changes that require treatment.
Long term recall appointments done because the following changes occurred

- Mucosal changes
- Bone resorption
- Occlusal changes
- Adaptation of patient.

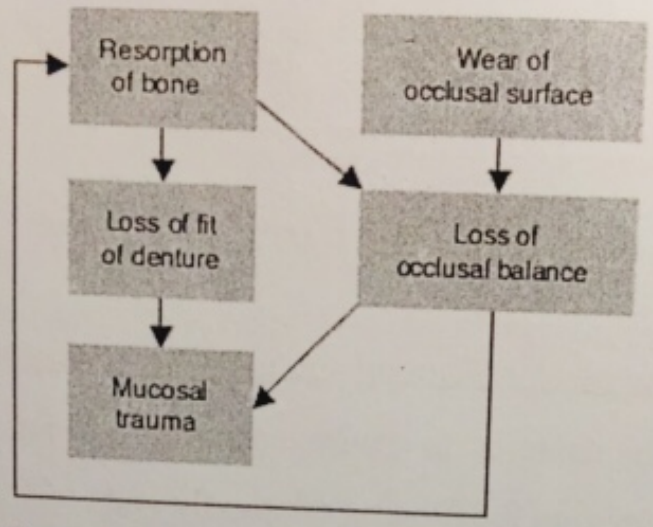


Figure 15.2 Cycle of tissue damage resulting from lack of denture maintenance.

Mucosal changes

The need to carry out periodic checks with respect to oral cancer was stressed. In 2007, in the UK, there were 5325 new cases and 1841 deaths, with an increased prevalence in deprived communities. It should be emphasised that the typical edentulous patient falls into a risk group, as a retrospective study of patients with oral cancer showed that 59% were edentulous, tended to be older than 60 years, were tobacco and alcohol users, had a lower socioeconomic status and had a somewhat negative attitude to recall appointments.

Bone resorption

The long-term changes in shape of the residual ridges and the consequent effect on dentures have been studied extensively. A continuing reduction in height of the alveolar ridges over a period of 25 years has been observed. There appears to be a marked reduction in the first year of denture wearing and in the next few years a continuing loss averaging 1 mm each year. Over periods of time, the loss in height of the anterior lower ridge is four times that of the upper. As the lower denture covers a much smaller area, the functional stress transmitted to the underlying tissues is greater than that to the upper tissues; thus, it is likely that the greater loss of mandibular bone is due to the physiological limit of this

tissue being exceeded. The resorption of bone brings in its wake a loss of both occlusal vertical dimension and rest vertical dimension. The former dimension is reduced to a greater extent and thus the freeway space is increased.

Occlusal changes

The progressive loss of fit of dentures, resulting from resorption of bone, also leads to deterioration in occlusal balance. In the case of dentures with acrylic teeth this occlusal deterioration can be aggravated by occlusal wear. The combination of loss of fit and occlusal imbalance encourages mucosal inflammation and further bone resorption, thus establishing a vicious cycle. It is clearly important, if oral health and function are to be maintained, that this cycle is broken by regular denture review and effective maintenance.

Adaptation of the patient

The progressive long-term deterioration of dentures that has been described is not invariably associated with a complaint. This is because adaptive changes can occur and a tolerance can develop which allows patients to continue wearing the dentures. Thus, a considerable amount of tissue damage can go unnoticed. Whereas successful adaptation to new dentures is a prerequisite for success, a patient who tolerates slowly developing faults beyond a certain point will store up troubles for the future. In addition to the likelihood of tissue damage, reduction in rest vertical dimension and the adoption of abnormal mandibular postures create problems for both the clinician and the patient when replacement dentures are eventually required.

The first long-term recall appointment should be made no more than a year after the dentures were first fitted. Thereafter, an appointment every 2 or 3 years to check on tissue health and quality of the dentures is a realistic arrangement, on the mutual understanding that the patient will attend sooner if problems develop

in the meantime. The clinician should make the point that the dentures have a limited life and should stress to the patient the potential dangers of wearing dentures that have become inadequate.

Treatment required at long-term recall appointments will be one, or a combination, of the following:

- Adjustment of the impression surface
- Correction of denture base extension
- Occlusal adjustment with or without a check record
- Reline or rebase of the dentures
- Construction of replacement dentures.

Following prosthetic complications have been recorded as a result of research done by Hakan B. et al 2012 for complete denture wearers

1. Loss of retention (62.5%)
2. Existence of any denture irritation or ulceration (51.6%)
3. Existence of any debonded/fractured artificial teeth (26.6%)
4. Existence of any fracture in the denture base (31.3%)
5. Existence of denture stomatitis (9.4%)
6. Existence of epulis fissuratum
7. Existence of inflammatory papillary hyperplasia

Some Clinical Problems and Solutions associated with complete denture

- Pain and instability
- Lack of saliva
- Hard and soft materials for modifying the impression surface of dentures

- The flabby ridge
- Midline fracture
- Debonding of teeth
- Gagging reflex
- The burning mouth syndrome
- Disturbance of speech.

Pain and instability:

The most common problems associated with complete dentures are pain and instability of the dentures. They are summarised in the table below. The most likely main complaints have been indicated in each case. However, it should be remembered that there is considerable overlap between the two columns, as any cause of instability may additionally give rise to a complaint of pain. It should also be stressed that there may be more than one cause of a complaint.

Persistent pain: This problem is more often seen in the lower jaw where the area available for distribution of the occlusal load is relatively small. As noted in the table below, there are many possible causes of this complaint, which may be attributed to the denture design and to the patient.

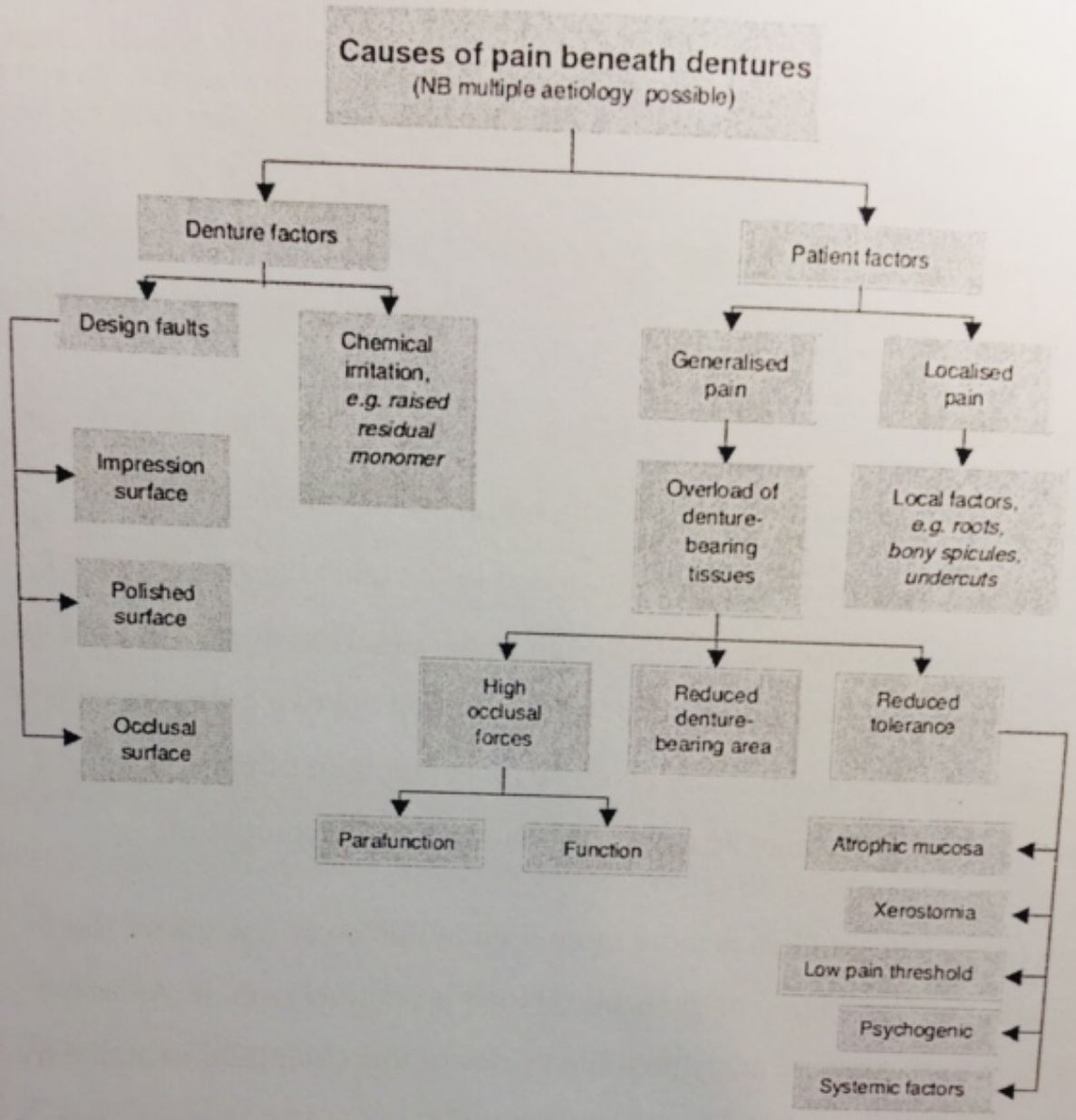


Figure 16.1 A diagnostic flow chart of the various possible causes of pain beneath dentures.

Discomfort can arise from overloading of the mucosa as a result of clenching or grinding the teeth. These occlusal habits are caused by increased activity of the masticatory muscles produced during stressful situations.

In treating parafunction, the patient must be made aware of the problem and should be told that teeth should be out of contact for most of the time. It is important to reassure the patient, describe the link between stress, parafunction and pain under dentures and point out that there is no change in the oral mucosa. The importance of conscious relaxation should be emphasised and the patient

should be strongly encouraged to leave both dentures, or at least the lower denture, out at night.

Another complication is *Lack of saliva*

Functions of saliva

Saliva possesses the following functions in the edentulous patient:

- Denture retention – saliva is an essential component in the physical retention of complete dentures.

- Lubrication – the glycoproteins in saliva facilitate movement of the soft tissues during speech, mastication and the swallowing of food.

- Cleansing – saliva physically washes food and other debris from the soft tissues and from the polished surfaces of prostheses

- Taste – flavours are perceived only when substances are in solution in saliva or other fluids. It prepares food for swallowing and facilitates the sense of taste

- Digestion – digestion begins during mastication when salivary amylase starts to breakdown glucose.

- Antimicrobial – there are antimicrobial components, such as antibodies, in saliva which help to maintain a normal balance of the oral flora.

Problems of reduced salivary flow

A reduction, or absence of saliva (xerostomia), is likely to cause problems with all the functions listed above so that a general, and significant, reduction in the quality of life results. Reduced retention of dentures is a particular problem for edentulous patients.

There may also be an increased susceptibility to denture trauma resulting in complaints of pain and in some case the burning mouth syndrome

Aetiology of reduced salivary flow

Medical History: A full history is taken including a 'I'm taking an anti-depressant and question on current medication a diuretic''For how long have you been 'One year' DRY MOUTH is a possible taking these tablets?' contributory factor to the oral complaint

Social History: The history has revealed a number of possible causes of the persistent pain. The diagnosis can be established only after a careful examination of the patient, the mouth and the various sets of dentures in order to confirm or deny the various possibilities. The point should be made that unless a full history is obtained some of the possible causes might never be revealed. The provision of new dentures would do little to eliminate the problem if the persistent pain was due to a dry mouth and to parafunction.

However, the condition is relatively common in middle-aged and older people, the main candidates for complete dentures, with between 12% and 16% complaining of a dry mouth

The commonest causes of dry mouth (Niedermeier *et al.* 2000; Field *et al.* 2001) are:

- Adverse effects of drug therapy, e.g. tricyclic antidepressants, beta-blockers
- Depression and chronic anxiety
- Dehydration
- Mouth breathing
- Auto-immune disease like Sjögren's syndrome
- Head and neck radiotherapy
- Poorly controlled diabetes

, Smoking.

A complaint of dry mouth can occur in the absence of the clinical signs of dryness ('symptomatic xerostomia'). Under such circumstances the physical retention of the dentures would not be expected to be diminished.

Management of dry mouth

In clinical xerostomia there are intra-oral signs of dryness such as a dry, atrophic mucosa and lack of saliva pooling in the floor of the mouth. The dentist can check the dryness of the buccal mucosa simply and quickly during the examination of the patient by carrying out the '*mirror test*'. For this the dentist lightly presses the face of the mirror against the buccal mucosa and then tries to remove it. If the mirror comes away easily the mucosa is still covered by a substantial film of saliva; if the mucosa adheres to the mirror then it is dry.

Close collaboration with the patient's general medical practitioner or with a specialist in oral medicine is often necessary. It might be possible, for example, to change an existing xerostomic drug to one less liable to reduce salivary flow. As there is a definite relationship between fluid intake and secretory performance it is essential that the patient is kept well hydrated. Chewing and energetic exercise improve salivary flow, possibly because of improved blood circulation to the glands. In cases where flow rate cannot be improved limited relief may sometimes be obtained by the use of artificial saliva.

Measures for managing xerostomia : *may be local or systemic*

Local measures:

1. Artificial saliva. In cases where the salivary flow rate cannot be improved limited relief may sometimes be obtained by the use of artificial saliva

2. Denture and oral hygiene. It is very important for a denture patient with a dry mouth to maintain an excellent level of denture hygiene. The likelihood of the proliferation of Candida albicans and other microorganisms is increased in xerostomia and therefore unless denture hygiene is maintained at a high level the denture is likely to be rapidly colonised by the micro-organism, resulting in denture stomatitis. Motivation and instruction of the patient, followed by monitoring the quality of denture hygiene are essential.
3. Denture retention. In cases where an intractable dry mouth gives rise to a persistent problem of loose dentures a denture adhesive will usually provide some improvement in denture function.

Systemic measures:

- *Treatment of an underlying disease*. It might be possible, for example, to change an existing xerostomic drug to one less liable to reduce salivary flow. Also if the patient is diabetic, an improved glycaemic control will alleviate the xerostomia.
- *Increasing fluid intake*. As there is a relationship between fluid intake and secretory performance, it is essential that the patient is kept well hydrated.
- *Sialogogues*. Pilocarpine can stimulate salivary flow where some functional salivary tissue remains, particularly in drug-related xerostomia, but it commonly has unpleasant side effects such as increased sweating. The dry mouth may also be occasionally alleviated by sialogogues such as sugar-free chewing gum, glycerine or scorbic acid and lemon mouthwash

Cleaning dentures it should be done for: Deposits form on dentures such as:

- Microbial plaque
- Calculus
- Food debris.

These deposits may be responsible for a variety of problems including:

- Denture stomatitis
- Angular stomatitis
- Unpleasant tastes
- Odours
- Unsightly appearance
- Accelerated deterioration of some denture materials such as short-term soft lining materials.

The effective cleaning of dentures is therefore of considerable importance to the patient's general well-being and oral health.

- IPH-Inflammatory Papillary Hyperplasia, Candidiasis and Wearing ill-fitting dentures 24h/7 days, are contributing factors. Resolve before making new dentures because, if left as it, new dentures will be loose after placement, as inflammation resolves. Treatment by:

- Leave dentures out at night.
- Reline with tissue conditioner.
- Nystatin mouth rinse

In cases where an intractable dry mouth gives rise to a persistent problem of loose dentures a denture adhesive will usually provide some improvement in denture function.

Hard and soft materials for modifying the impression surface of dentures

Materials which can be used to modify the impression surface to overcome some of these problems; these materials can either be applied by the dentist at the chairside or by the dental technician in the laboratory.

The materials may be classified as follows:

- Hard materials
- short-term soft lining materials
- long-term soft lining materials.

Hard materials

Recent years have seen the development of a group of useful materials, frequently described as chair side reline materials, which can be used to modify the impression surface of an existing denture.

Composition

Commonly these materials consist of a powder containing polyethylmethacrylate together with a liquid monomer, butylmethacrylate. The important point to make is that monomeric methylmethacrylate, a tissue irritant, is avoided. Many of the products include a primer to enhance the adhesion of the material to the existing denture polymer. The available materials vary in working time, setting time and viscosity. These materials can be useful for relining dentures. As they can be used at the chairside a 'one-stop' reline technique can be employed.

Clinical applications: This has great benefits in the following situations:

1. A laboratory reline would require the patient to be without any denture for an inconvenient length of time.(patient have one set of denture and socially unacceptable to be without denture and in case of immediate denture patient).
2. A reline is required, but it is not necessary for it to last for much longer than a year. (the immediate denture patient is likely to fall into this category, as after a year the chairside reline will usually need replacing by a permanent rebase or by a replacement denture.

3. Where a direct technique is indicated. (A chairside reline).

Clinical performance: Clinical trials have shown that the best of this group of materials are convenient to use and provide immediate improvement of fit and comfort. Over a period of time there is a loss of material, especially at the borders of the denture; this loss is more apparent in the lower denture. However, the loss does not appear to cause marked deterioration of fit or comfort. The better materials should be regarded as having a working life of about one year. The surface can be cleaned in the normal manner and there is relatively little discolouration.

Short-term soft lining materials

Composition

Most materials are supplied in a powder/liquid form. An alternative presentation is in a ready-to-use sheet form which can be found in one product available to the dental profession and in several 'over the counter' products available directly to the general public.

It is essential that traumatised tissue is examined by the dentist and that rational, rather than empirical, treatment is prescribed.

The composition of the powder/liquid types is as follows:

(1) *Powder*. Polyethylmethacrylate, or copolymers of polyethyl/methylmethacrylate.

(2) *Liquid*. A mixture of:

(a) an aromatic ester, such as dibutyl phthalate which acts as plasticiser

(b) ethyl alcohol.

Clinical applications

Short-term soft lining materials are placed in existing dentures for the following reasons.

(1) *Tissue conditioning*. For tissue conditioning, the material is applied for a period of a few days to the impression surface of a denture when the mucosa is traumatised and inflamed. The tissue conditioner acts as a cushion absorbing the occlusal loads, improving their distribution to the supporting tissues and encouraging healing of the inflamed mucosa.

(2) *Temporary soft reline*. A short-term soft lining material can be used to improve the fit of a denture, typically an immediate restoration.

(3) *Diagnosis*. A short-term soft lining material can be used as a diagnostic aid where the dentist wishes to check the reaction of the patient and the tissues to an improvement in fit of a denture.

(4) *Functional impression*. A short-term soft lining material can be used as a functional impression material applied to the impression surface of a denture for the purpose of securing an impression under functional stresses.

(5) *Recording the neutral zone*. The ability of these materials to be moulded by the oral musculature over an extended period of several minutes allows them to be used to record the neutral zone

Long-term soft lining materials

Long-term soft lining materials distribute stress more evenly under dentures than do the hard denture base materials. They also absorb impacts that can arise from masticatory function. They can therefore be said to have a shock-absorbing or cushioning effect. As a consequence it has been shown that the addition of a long-term soft lining to a complete lower denture improves the ability to bite and chew and provides general improvement in comfort when compared with hard relines. The lining has also been shown to improve masticatory performance

Indications for use

(1) *Persistent pain under a denture.*

(2) *Thin atrophic mucosa.*

(3) ***Parafunction.***

It is useful to consider the first three indications together, as a complaint of persistent pain may be due to the poor quality of the denture-bearing mucosa or to the patient's inability to regulate gripping or grinding habits. It is important to make two points; ***first***, the problem is almost always found in the lower jaw and, ***second***, it is essential to ensure that all existing denture faults have been eliminated before deciding to proceed with a long-term soft lining.

(4) ***Replacing an existing denture which has a soft lining.*** Once a patient has successfully worn a lower denture with a soft lining and has got used to its 'feel' it is often wise to repeat the prescription. If this is not done and the new denture is made with a hard base the patient may have problems in adapting to it and reject the prosthesis as a result.

(5) ***Sharp bony ridges or spicules.*** The pattern of resorption of the mandible may result in sharp ridges or spicules of bone on which the denture-bearing mucosa. The problem might be overcome, at least in the short term, by surgically smoothing the bone. However, there are often occasions where poor health or a strong preference by the patient to avoid surgery are contraindications to this approach. There is also the danger that surgical interference with the mandible will speed up resorption of the bone. An alternative, conservative approach is to provide a soft lining, which often provides an acceptable level of comfort under these circumstances.

(6) ***Superficially placed mental nerve.*** Another consequence of advanced resorption of the mandible is that the mental foramen and mental nerve may become superficially placed within the denture-bearing area so that the nerve is

traumatised during function. This typically gives rise to a complaint of a severe, sharp, stabbing pain from the area of the mental foramen which is brought on by biting. A soft lining restricted to the problem area may provide relief. However, it is not uncommon to find that a superficial mental nerve requires greater pressure relief than can be provided by a soft lining. If this is the case it may be necessary to cut the denture away in the area of the nerve to eliminate pressure on the nerve altogether.

Types of long-term soft lining

Soft linings are made either of silicone rubber or soft acrylic. The silicone materials may be cold-curing or heat-curing. The soft acrylics are heat-curing; cold-curing soft acrylics have a very limited life span and are best thought of as temporary soft linings.

Complications in complete denture wearers .....continue.....

The flabby ridge

This condition is most frequently seen in the upper anterior region. The bone becomes grossly resorbed, often up to the level of the anterior nasal spine, and is replaced by fibrous tissue. As a result of this mobile fibrous tissue, the stability of a complete denture will be poor and both function and appearance can be heavily compromised.

Aetiology

It has long been believed that the condition, sometimes called the 'combination syndrome', is caused by the presence of lower natural teeth. This is probably not surprising when the many factors that influence bone metabolism are considered. Nevertheless it is probably wise to keep such patients under regular review to ensure that a dramatic level of damage is not occurring.

Management

Approaches to treatment

The management of this condition is somewhat controversial, opinion falling into two camps. In ***one***, surgical removal of the fibrous tissue is favoured in every case where the health of the patient allows. This approach produces a firm ridge which is reduced in size. Advocates of the opposing view suggest that surgical removal should rarely, if ever, be carried out because the fibrous tissue may have a cushion effect which reduces trauma to the underlying bone. If the tissue is removed, it must be replaced by denture base material with consequent increase in the bulk and weight of the prosthesis.

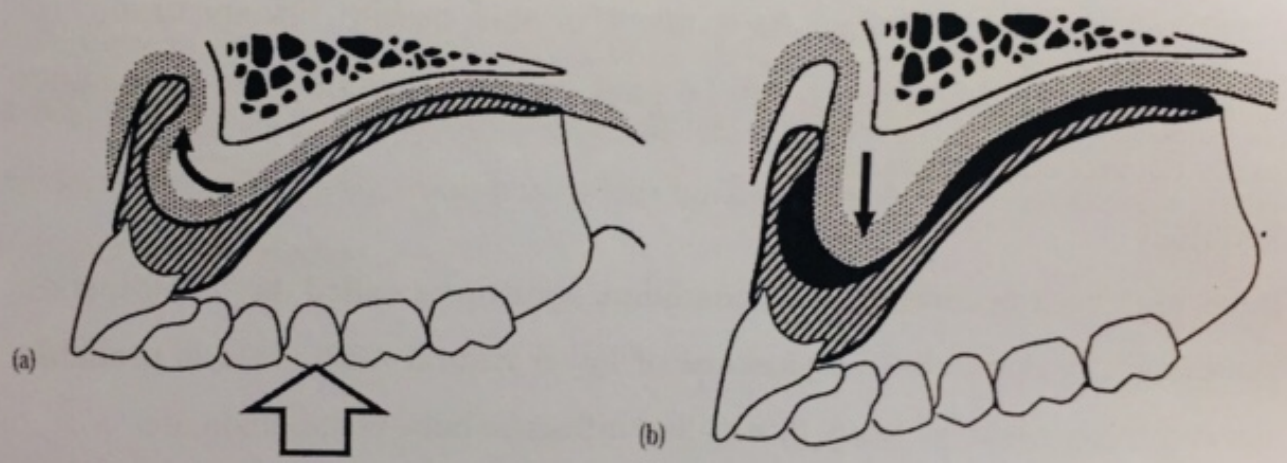
Second: Non-surgical treatment:

A key aspect in the non-surgical management of the flabby ridge is the choice of impression technique employed:

To employ a mucodisplacive impression technique which compresses the flabby tissue in order to try and obtain maximum support from it or,

To use a mucostatic impression technique with the aim of achieving maximum retention.

(a) Under occlusal pressure, the upper denture is seated and the flabby anterior ridge
(b) When the teeth are apart, the flabby tissue recoils and displaces the denture downwards.



Denture breakages

Midline fracture of the complete upper denture accounts for 29% of all repair work in dental laboratories, whilst teeth debonded from complete dentures account for 33%These two common problems will be considered.

Types of fracture

- ***Fatigue of the acrylic resin***

Fatigue fracture results from repeated flexing of the denture by forces too small to fracture it directly. Failure of the denture base is due to the progressive growth of a crack originating from a point on the surface where an abrupt change in the surface profile causes a localised concentration of stress many times that applied to the bulk of the denture. The crack often starts palatally to the upper central incisors, grows slowly at first but undergoes an enormously increased rate of growth just before the denture fractures. A failure of this type

most commonly occurs in dentures that are about 3 years old. Midline fracture due to fatigue of the acrylic resin is the commonest type of denture breakage.

- ***Impact***

Denture breakage might occur, for example, if the patient accidentally drops the denture while cleaning it. It might also result from an accident in which the patient receives a blow to the mouth. Whenever possible, the cause, or causes, of the fracture must be identified before the denture is repaired or replaced. Unless this is done and the cause attended to, the denture is likely to fracture again within a short period of time.

Causes of fracture:

A. Denture factors

- Stress concentrators.
- Absence of a labial flange.
- Incomplete polymerisation of the acrylic resin.
- Previous repair.
- Shape of the teeth on the denture.
- Poor fit.
- Lack of adequate relief.

B. Patient factors:

- Anatomical factors: a prominent labial frenum will require a deep notch in the flange resulting in stress concentration in that area.
- High occlusal loads: These may occur in patients with powerful muscles of mastication, or whose natural lower teeth are still present, or who are bruxists.

Debonding of teeth

The usual reasons for a weak bond between tooth and denture base are:

• The presence of tin-foil substitute on the ridge-lap surface of the tooth

• The presence of residual wax on the same surface

• The use of cross-linked teeth which are incompatible with the particular denture base polymer.

Of the various recommendations that have been made for minimising the risk of debonding the following have received fairly widespread support

(1) Choose artificial teeth and a denture base polymer which are compatible by checking the information sheets provided with the products or by seeking information from the manufacturers. Conventional denture teeth tend to achieve a higher bond strength than cross-linked teeth.

(2) Ensure all traces of wax and tin-foil substitute are removed. The complete removal of wax is not consistently achieved with boiling water alone and so for optimum bond strength the use of a wax solvent is recommended .

(3) Drill small channels into the palatal surface of the teeth to increase the area available for the polymerising denture base resin. However, it needs to be remembered that such recesses in the ridge-lap surface of the teeth can make complete wax removal more difficult. Therefore particular care needs to be taken when removing the wax, otherwise the adjustments can result in a weaker, rather than a stronger bond.

(4) Apply a solvent such as dichloromethane to the ridge-lap surface of the teeth. The solvent creates microscopic pores and channels which promote diffusion of the polymerisable materials.

(5) Use a heat-curing denture base polymer. This material polymerises more slowly than a cold-curing material and ensures better penetration into the tooth substance.

Gagging reflex (retching)

Is a protective reflex which guards the airway and posterior oropharynx. It may

occur during prosthetic procedures such as impression taking, or when dentures are worn or, in extreme cases, when a mouth mirror is placed on the lips or tip of the tongue.

Aetiology

There are a number of causes that may be conveniently grouped together as follows.

(1) Somatic. The term 'somatic' covers those situations where the reflex is triggered by tactile stimulation of the soft palate, posterior third of the tongue.

(2) Iatrogenic. Iatrogenic causes, which are related to the dentures, are numerous. Some patients begin to retch after new dentures are inserted, but in most cases this reflex soon disappears as they adapt to the dentures. However, the reflex may persist if there are faults with the dentures such as an excessive occlusal vertical dimension, or if the dentures are stimulating the sensitive areas of the soft palate and tongue directly.

This stimulation may be caused by palatal over-extension, a posterior border which is too thick or poorly adapted, the teeth encroaching on tongue space or indeed by any factor producing denture instability.

An upper denture whose posterior border is under-extended posteriorly can provoke gaging because as the edge of the denture terminates on relatively incompressible mucosa a satisfactory post-dam cannot be produced. This result in poor retention, which increases denture instability, stimulates the tongue and palate, and causes apprehension in the patient. When this diagnosis is established, it requires a very careful explanation by the dentist to convince the patient that to cure the problem it will be necessary to cover more, rather than less of the palate.

(3) Psychogenic. Psychogenic causes may arise from sight, sound or thought. They include the sight of impression material being mixed or the sound of another patient retching. The patient may be extremely apprehensive because of an unhappy first experience of dental procedures or as a result of disturbing

stories from friends. In rare instances, retching may be a manifestation of a psychological disturbance which is not primarily related to the patient's dental treatment.

(4) Systemic. Less frequently, the causative factor may be systemic disease, particularly conditions affecting other regions of the gastrointestinal tract; for example, the link between retching and alcoholism may be related to the persistent gastritis found in such patients. Persistent catarrh will prevent nose breathing and may contribute to the problem of retching.

Patient management:

- ***Assessment of the severity of the problem***

A carefully taken history will reveal the severity of the problem and provide clues as to the cause. For example, a situation where a patient has been able to tolerate the clinical stages of denture construction, but then has difficulty in wearing the finished dentures, points to an iatrogenic cause which should be treated relatively simply by correcting the error in denture design.

- ***Impressions***

Most of individuals find impression taking unpleasant. However, retching during impression taking can usually be prevented by the following:

(1) *Reassurance and relaxation.*

It is very important that the dentist has a confident and relaxed chairside manner. It is essential that the anxious patient is reassured and encouraged to relax both physically and mentally. The dental nurse can also play a major role in creating an appropriate state of mind in the patient.

(2) *Position of the patient.*

The dental chair should be adjusted so that the patient is sitting comfortably in the upright position.

(3) *Breathing through the nose.*

Instructing the patient to breathe through the nose while the tray is being tried in the mouth or the impression is being taken is one of the most helpful methods of

preventing retching. During nasal breathing the soft palate remains stationary in its low position and the tongue in its 'guarding' position, protecting the nasopharynx from the threat of the foreign body in the mouth. If the patient breathes through the mouth, this protection is lost and movement of the soft palate results in intermittent contact with the setting impression material, increasing stimulation.

(4) *Impression technique.*

Impression trays should be well fitting. As close-fitting special trays are less bulky than spaced trays, they are better tolerated and should be used whenever possible.

When trying trays in the mouth, firm, positive movements should be used. Most patients tolerate the lower impression better than the upper one, so if the lower impression is taken first, the success of the procedure is likely to reassure the patient. The impression material should be mixed or prepared out of sight of the patient and the amount placed in the tray kept to the minimum necessary to record the relevant structures. A saliva ejector should be used if copious amounts of saliva collect in the floor of the mouth.

(5) *Distraction.*

It is during the insertion of the impression and while the material is setting that it is particularly important to distract the patient's attention from what is going on. This may be achieved by the dentist talking about something that is known to be of particular interest to the patient, or by reinforcing the requirement that the patient continues to breathe slowly and steadily through the nose. It has even been suggested that the patient be asked to raise one leg and to concentrate on not lowering it until the impression has set!

The severe gagging reflex

The ***first*** challenge when trying to treat a patient who has this problem is to obtain an accurate impression so that a well-fitting denture base can be constructed.

The ***second*** challenge is to provide a prosthesis that can be worn by the patient for a reasonable length of time.

The following approaches to the management of this difficult problem have been found useful:

(1) *Conscious sedation*

(2) *Acupuncture*. The gag reflex has been shown to be capable of being controlled by acupuncture. Although there is evidence to show that the technique is of assistance when undertaking the various clinical stages of denture construction there is, as yet, no evidence that it can be used by the patient to allow the denture to be worn.

(3) *Hypnosis*. Hypnosis has been used in the treatment of severe cases its success is dependent upon the patient being well motivated and being able to practise self-hypnosis, thus enabling a denture to be worn outside the dental surgery

(4) *The training denture*. The training denture approach may be of value when treating any patient with a long history of difficulties which suggest frank denture intolerance,including retching.

The burning mouth syndrome

The burning mouth syndrome (BMS) can be very troublesome to the patient, presents problems of diagnosis and often involves prolonged treatment. The symptoms occur in 5–7% of the adult population. Of those who seek treatment, there is a predominance of women, with a mean age of approximately 60 years. The most common sites of the complaint are the tongue and the upper denture-bearing tissues. Rather less common are the lips and lower denture-bearing tissues. The oral mucosa appears normal.

Many of the BMS patients have consulted a number of health care professionals before seeking help from the dentist or dental specialist. They know of no other people with the complaint and therefore feel quite isolated. If several

professionals have stated that the mouth looks normal the patient may start to feel as if 'it is all in the mind'. The level of anxiety is consequently raised and cancerophobia may well develop.

Classification

Three types of BMS have been described. The classification is useful as it points the way towards appropriate treatment and a probable prognosis.

Type 1

There are no symptoms on waking. A burning sensation then commences and becomes worse as the day progresses. This pattern occurs every day. Approximately 33% of patients fall into this category and are likely to include those with haematinic deficiencies and defects in denture design.

Type 2

Burning is present on waking and persists throughout the day. This pattern occurs everyday. About 55% of patients are placed in this category, a high proportion of who have chronic anxiety and are the most difficult to treat successfully.

Type 3

Patients have symptom-free days. Burning occurs in less usual sites such as the floor of the mouth, the throat and the buccal mucosa. This category is made up of the remaining 12% of patients. A study of this group has shown that the main causative factors are allergy and emotional instability. The investigation of these patients is likely to include patch testing.

Aetiology

BMS has been attributed to a multitude of causes and these broadly fall into three groups:

- Local irritants including denture faults
- Systemic factors
- Psychogenic factors.

Local irritation

Denture faults

Errors in denture design which cause a denture to move excessively over the mucosa, which increase the functional stress on the mucosa or which interfere with the freedom of movement of the surrounding muscles may initiate a complaint of burning rather than frank soreness.

Denture design errors have been discovered in 50% of BMS patients.

Residual monomer

High levels of residual monomer in the denture base have been reported and the tissue damage produced is considered to be the result of chemical irritation rather than a true allergy. It is possible that high levels of residual monomer, which have ranged from three to ten times the normal value, are due to errors inadvertently introduced into the short curing cycles which are popular with manufacturers and dental laboratories. If the requisite curing temperature of 100°C is not achieved in the relevant part of the short curing cycle, there is a marked increase in residual monomer content . Some authorities may not consider this condition to be an example of BMS where, classically, the mucosa looks normal. However, a patient who reacts to a high level of residual monomer complains of a burning sensation and so we feel justified in including it.

Micro-organisms

The role of micro-organisms in burning mouth syndrome is controversial and studies have not shown a link between the presence of Candida albicans and the complaint.

Smoking and mouthwashes

Smoking and the regular use of some mouthwashes are irritants that have been implicated in BMS.

Systemic causes

Nutritional deficiencies

Contributions from nutritional deficiencies such as iron, vitamin B complex and folic acid should be highlighted. An example of BMS caused by a deficiency is Iron deficiencies have been found in 8% and folic acid deficiencies in 6% of BMS patients. Low blood levels of vitamin B1 and B6 were found in 40% of patients.

Endocrine disorders

What is apparent is the relative unimportance of the climacteric as a causative factor, a modern viewpoint which is at variance with past clinical opinion. On rare occasions, the symptoms are found to be linked with an undiagnosed diabetes mellitus. Treatment of the medical condition invariably results in complete resolution of BMS.

Xerostomia, frequently associated with BMS .One that should be highlighted here is drug-induced xerostomia. Recent investigations have produced evidence of a link between BMS and reduced parotid gland function and ofantidepressant medication reducing the salivary flow.

It should be recognised that the presence of a dry mouth is capable of accentuating the symptoms initiated by any of the causes of local irritation. This is an example of the multifactorial nature of BMS.

Hypersensitivity

True hypersensitivity to constituents of denture base polymer is rare and usually results in local symptoms such as burning or itching. In one instance where there were systemic symptoms of nausea, dizziness and general malaise the patient was found to have reacted to dyes used to colour the polymer. Dentures made of clear polymer proved successful

Parkinson's disease

It has been reported that the prevalence of BMS was 24% in people suffering from Parkinson's disease;

Psychogenic causes

The more common disorders associated with BMS are anxiety, depression, cancerophobia and hypochondriasis. The associated parafunctional activities such as bruxism and abnormal and excessive tongue movements are capable of inducing mucosal irritation.

Management

Faced with a multitude of causative factors, it will be recognised that the process of diagnosis and treatment is usually a time-consuming affair.

- Initial assessment (history/examination/special tests).
- Provisional diagnosis.
- Initial treatment (e.g. elimination of local irritants and investigating and treating haematinic deficiencies).
- Assessment of initial treatment.
- Definitive diagnosis.
- Definitive treatment (local/systemic correction/psychological therapy).
- Follow-up.

With regard to outcome, analysis of various studies suggests that about two-thirds of BMS patients are either cured or improved to such an extent that the burning sensation is no longer an overwhelming problem. There remain a group of patients for whom the current state of knowledge can offer relatively little benefit. Some in this small group remain totally resistant to treatment. However, it should be remembered that even in these refractory cases BMS is not necessarily a life sentence as spontaneous remissions can eventually occur for no apparent reason.

Disturbance of speech

The presence of complete dentures can modify speech by affecting articulation and by altering the degree of oral resonance. A number of sounds are articulated by contact of the tongue to the palate and to the teeth. A change in speech that may be quite marked when the dentures are first inserted will usually disappear completely within a few days. However, if the changes in the contact surfaces

require a modification of tongue behaviour that is beyond the adaptive capability of an individual patient, a speech defect will persist. It should also be remembered that the tongue of a patient who is wearing complete dentures has a dual function – to take part in speech articulation and to control the dentures. If the dentures are loose, the demands of this latter function may be so great that there is a general deterioration in the quality of speech. As mentioned

The following relationships are particularly important to the production of clear speech.

(1) *Tip of the tongue to the palate.*

Contact between the tip of the tongue and the palate is required in the production of */s/*, */z/*, */t/*, */d/* and */n/*. Consequently, a change in the shape or thickness of the denture contact surface resulting from the fitting of new dentures will require a modification of tongue behaviour in order to produce sounds which are the same as before. In the vast majority of cases, the necessary modification occurs without any difficulty in a relatively short period of time.

The sound most commonly affected in this way is */s/*, a sound which is generally produced with the tongue tip behind the upper anterior teeth. A narrow channel remains in the centre of the palate through which air hisses .If the palate is too thick at this point, or if the incisors are positioned too far palatally, the */s/* may become a */th/*. If the denture is shaped so that it is diffi cult for the tongue to adapt itself closely to the palate, a channel narrow enough to produce the */s/* sound will not be produced and a whistle or */sh/* sound may result. This is most likely to be the consequence of excessive palatal thickening laterally in the canine region

(2) *Lower lip to incisal edges of upper anterior teeth.*

The lower lip makes contact with the incisal edges of the upper anterior teeth when the sounds */f/* and */v/* are produced. If the position of these teeth on a replacement denture is dramatically different to that on the old denture there is likely to be a disturbance in speech.

(3) *Lateral margin of the tongue to posterior teeth.*

Contact between the lateral margins of the tongue and the posterior teeth is necessary to produce the English consonants */th/*, */t/*, */d/*, */n/*, */s/*, */z/*, */sh/*, */zh/* (as in measure), */ch/*, */j/* and */r/* (as in red). Air is directed forwards over the dorsum of the tongue and may be modified by movement of the tongue against the teeth or anterior slope of the palate to produce the final sound. If the contact can only be achieved with difficulty,

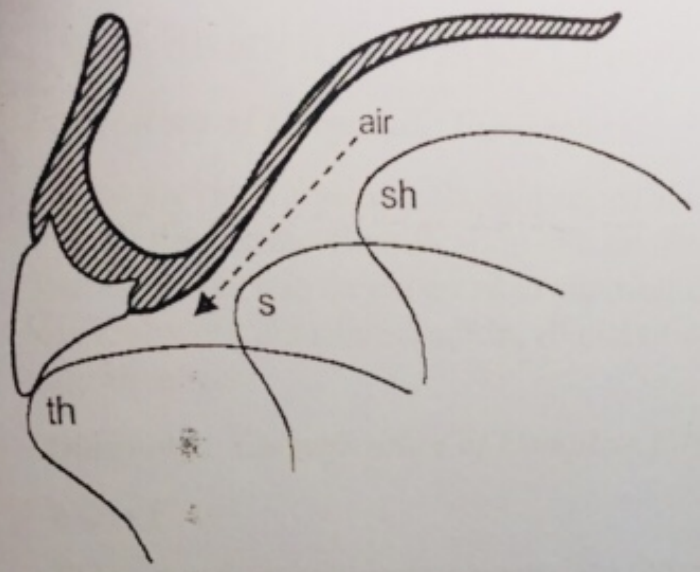
movement of the tip of the tongue may be restricted with consequent impairment of speech. This difficulty arises if the posterior contact surfaces are too far from the resting position of the tongue as a result of the occlusal plane being too high, the occlusal vertical dimension too great or the posterior teeth placed too far buccally.

In extreme cases, it may not be possible for the tongue to produce a complete lateral seal and so a lateral sigmatism develops.

(4) *The relationship of mandible to maxilla.*

The mandible moves closest to the maxilla during speech when the sounds */s/*, */z/*,*/ch/* and */j/* are made. Normally, at this time, there will be a small space between the occlusal surfaces of the teeth. However, if the occlusal vertical dimension of the dentures is too great, the teeth may actually come into contact so that the patient complains that the teeth clatter.

The position of the tongue for producing the sounds /th/, /s/ and /sh/.



Classification System for Complete Edentulism (continue)

Integration of Diagnostic Findings

The previous four sub classifications are important determinants in the overall diagnostic classification of complete edentulism. In addition, variables that can be expected to contribute to increased treatment difficulty are distributed across all classifications according to their significance.

Diagnostic Classification of Complete Edentulism

Class I

This classification level characterizes the stage of edentulism that is most appear to be successfully treated with complete dentures using conventional prosthodontics techniques. All four of the diagnostic criteria are favorable.

- Residual bone height of 21 mm or greater measured at the least vertical height of the mandible on a panoramic radiograph.
- Residual ridge morphology resists horizontal and vertical movement of the denture base; Type A maxilla.
- Location of muscle attachments that arc conducive to denture base stability and retention; Type A or B mandible.
- Class I maxillomandibular relationship

Class II (Fig 15 A-H)

This classification level distinguishes itself by the continued physical degradation of the denture supporting anatomy, and, in addition, is characterized by the early onset of systemic disease interactions,

patient management, and/or lifestyle considerations.

- Residual bone height of 16 to 20 mm measured at the least vertical height of the mandible on a panoramic radiograph.
- Residual ridge morphology that resists horizontal and vertical movement of the denture base; Type A or B maxilla.
- Location of muscle attachments with limited influence on denture base stability and retention; Type A or B mandible.

- Class I maxillomandibular relationship.
- Minor modifiers, psychosocial considerations, mild systemic disease with oral manifestation.

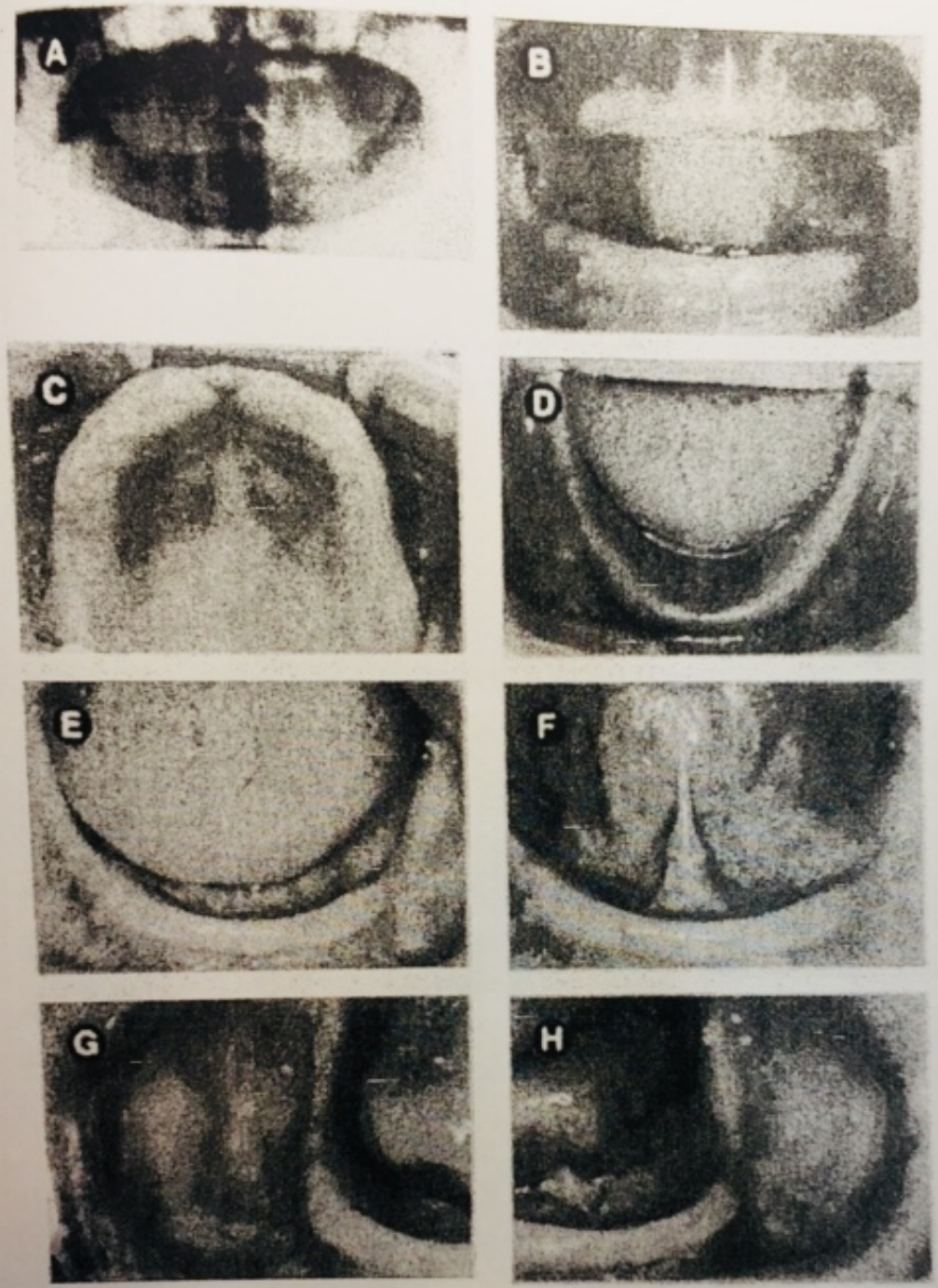


Figure 14. Class I patient. (*A*) Panoramic radiograph. (*B*) Facial view at the approximate occlusal vertical dimension. (*C*) Occlusal view: maxillary arch. (*D*) Occlusal view: mandibular arch. (*E*) Facial view: tongue in resting position. (*F*) Facial view: tongue elevated. (*G*) Lateral view of mandible: patient right. (*H*) Lateral view of mandible: patient left.

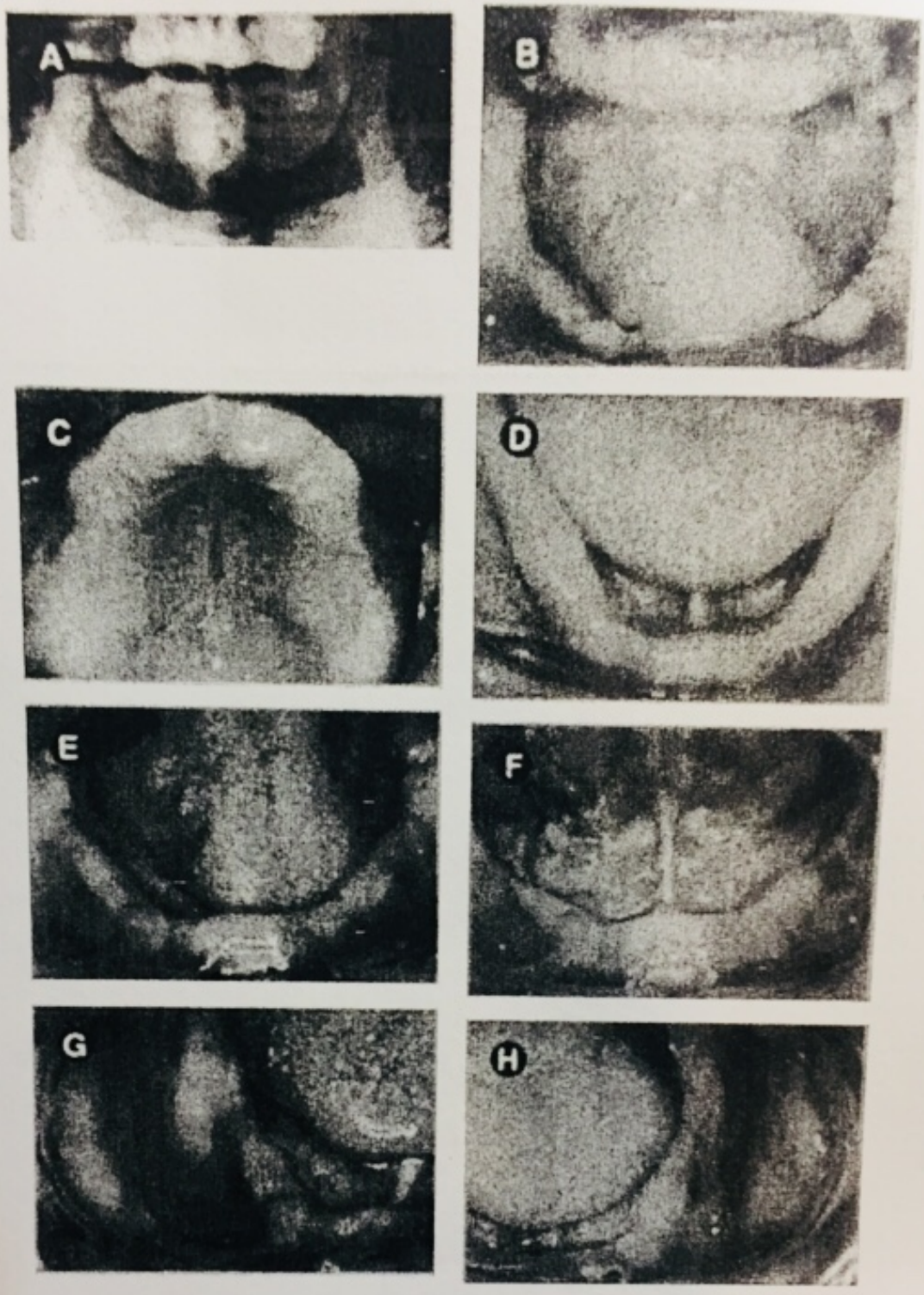


Figure 15. Class II patient. (*A*) Panoramic radiograph. (*B*) Facial view at the approximate occlusal vertical dimension. (*C*) Occlusal view: maxillary arch. (*D*) Occlusal view: mandibular arch. (*E*) Facial view: tongue in resting position. (*F*) Facial view: tongue elevated. (*G*) Lateral view of mandible: patient right. (*H*) Lateral view of mandible: patient left.

Class III

This classification level is characterized by the need for surgical revision of supporting structures to allow for adequate prosthodontic function. Additional factors now play a significant role in treatment outcomes.

- Residual alveolar bone height of 11 to 15 mm measured at the least vertical height of the mandible on a panoramic radiograph.
- Residual ridge morphology has minimum influence to resist horizontal or vertical movement of the denture base;

Type C maxilla.

- Location of muscle attachments with moderate influence on denture base stability and retention;Type C mandible.
- Class I, II, or III maxillomandibular relationship.
- Conditions requiring preprosthetic surgery:

1) minor soft tissue procedures;

2) minor hard tissue procedures including alveolotomy.

3) simple implant placement, no augmentation

4) multiple extractions leading to complete edentulism for immediate denture placement.

- Limited interarch space (18-20 mm).
- Moderate psychosocial consideration and or moderate oral manifestations of systemic diseases or conditions such as xerostomia
- TMD symptoms present.
- Large tongue (occludes interdental space) with or without hyperactivity.
- Hyperactive gag reflex.

Class IV

This classification level depicts the most debilitated edentulous condition. Surgical reconstruction is almost always indicated but cannot always be accomplished because of the patient's health, preferences,

dental history, and financial considerations. When surgical revision is not an option, prosthodontics techniques of a specialized nature must be used to achieve an adequate treatment outcome.

- Residual vertical bone height of 10 mm or less measured at the least vertical height of the mandible on a panoramic radiograph.
- Residual ridge offers no resistance to horizontal or vertical movement; Type D maxilla.
- Muscle attachment location that can be expected to have significant influence on denture base stability and retention; Type D or E mandible.
- Class I, II, or III maxillomandibular relationships.
- Major conditions requiring preprosthetic surgery:

I) complex implant placement, augmentation

2) surgical correction of dentofacial deformities;

3) hard tissue augmentation required;

4) major soft tissue revision required, ie, vestibular extensions with or without soft tissue grafting.

- History of paresthesia or dysesthesia.
- Insufficient interarch space with surgical correction required.
- Acquired or congenital maxillofacial defects.
- Severe oral manifestation of systemic disease or conditions such as sequelae from oncological treatment.
- Maxillo-mandibular ataxia (incoordination).
- Hyperactivity of tongue that can be associated with a retracted tongue position and/or its associated morphology.
- Hyperactive gag reflex managed with medication.
- Refractory patient (a patient who presents with chronic complaints following appropriate therapy).

These patients may continue to have difficult achieving their treatment expectations despite the thoroughness or frequency of the treatments provided.

- Psychosocial conditions warranting professional intervention

Reasons for a Classification System

Classifying edentulous patients according to present criteria can be an aid in numerous aspects of treatment:

- establishing a basis for diagnostic and treatment procedures
- justifying treatment procedures and fees to patients
- screening patients treated in dental faculties for assignment to undergraduate or graduate students
- providing data for review of treatment outcome
- simplifying communication in discussions of treatment with patients and colleagues.

The classes are differentiated from each other according to the following features:

- The skill level required to treat that class of patient: Does the patient require novice or expert treatment?
- The necessity for modification of basic clinical or laboratory procedures: Will more complicated procedures or more time be required for treatment?
- Overall management and complexity of treatment: Will expert intervention and referral be required?

Guidelines for Use of the Complete Edentulism Classification System

In those instances when a patient's diagnostic crileria are mixed between two or more classes, any single criterion of a more complex class places the patient into the more complex class. The analysis of diagnostic factors is facilitated with the use of a worksheet.

Use of this system is indicated for pre-treatment evaluation and classification of patients. Re-evaluation of classification status should be considered following preprosthetic surgery. Retrospective analysis on a post treatment basis may alter a patient's classification.

The classification system for complete edentulism is based on the most objective criteria available to facilitate uniform utilization of the system. With such standardization, communication will be improved among dental professionals.

This classification system will help to identify those patients most likely to require treatment by a specialist or by a practitioner with additional training and experience in advanced techniques.

This system should also be valuable to research protocols a different treatment procedures are evaluated.

Table I. Checklist for Classification of Complete Edentulism

	Class I	Class II	Class III	Class IV
Bone Height-Mandibular				
21 mm or greater				
16-20 mm				
11-15 mm				
10 mm or less				
Residual Ridge Morphology-Maxilla				
Type A - resists vertical & horizonal, hamular notch, no tori				
Type B - no buccal vest., poor hamular notch, no tori				
Type C - no ant vest, min support, mobile ant. ridge				
Type D - no ant/post vest, tori, redundant tissue				
Muscle Attachments-Mandibular				
Type A - adequate attached mucosa				
Type B - no b attach mucosa (22-27), +mentalis m				
Type C - no ant b&l vest (22-27), +genio & mentalis m				
Type D - att mucosa only in post				
Type E - no att mucosa,cheek/lip moves tongue				
Maxillomandibular Relationships				
Class I				
Class II				
Class III				
Conditions requiring Preprosthetic Surgery				
Minor soft tissue procedures				
Minor hard tissue procedures				
Implants - simple				
Implants with bone graft - complex				
Correction of dentofacial deformities				
Hard tissue augmentation				
Major soft tissue revisions				
Limited Interarch Space				
18-20 mm				
Surgical correction needed				
Tongue Anatomy				
Large (occludes interdental space)				
Hyperactive - with retracted position				
Modifiers				
Oral manifestations of systemic disease				
mild				
moderate				
severe				
Psychosocial				
moderate				
major				
TMD symptoms				
Hx of paresthesia or dysesthesia				
Maxillofacial defects				
Ataxia				
Refractory Patient				

Examples about questions on the subject ;

whats more important in the maxilla, the shape of the palate or the thickness of the bone?

the shap.

whats more important in the mandible, the shape of the ridge or the thickness of the bone?

the thickness

what class jaw realationship does class I edentulous pt have?

class I

maxillary residual ridge morphology resists horizontal and vertical movment of denture base: name the type?

type A

location of muscle attachments that are conducive to denture base stability and retention

type A, B- mandible

what is going on the class II patient physiologically and with their oral health?

early onset of systemic disease interactions, localized soft tissue factors and patient management/lifestyle considerations

what is the residual bone height of a class II pt?

16-20 mm

what class jaw relationship does the class II pt have?

class I

what types have residual ridge morphology that resists movement of denture

A, B- maxilla

what types have location of muscle attachments with limited influence on denture base stability and retention

Type A,B—Mandible

name the kind of disease condition exists in the class II patient (psychologically, systemically, orally)

- Minor modifiers, psychosocial considerations, mild systemic disease with oral manifestations and localized soft tissue conditions

what is class III characterized by clinically

characterized by the need for surgical revision of denture supporting structures to allow for adequate prosthodontic function.

residual bone height of class III pt

11-15 mm

what jaw relationship does the class III pt have

I, II, or III

in what type of pt does Residual ridge morphology have minimum influence to resist horizontal or vertical movement of the denture base—type C max

in what sort of pt do Location of muscle attachments yield moderate influence on denture base stability and retention—

type C mandible

what are some things that would require preprosthetic surgery

Minor soft tissue procedures

- Minor hard tissue procedures
- Implant placement (simple)—no augmentation required
- Multiple extractions leading to complete edentulism for immediate denture placement
- Limited interarch space—18-20 mm
- Moderate psychosocial considerations and/or moderate oral manifestations of systemic diseases or localized soft tissue conditions
- TMD symptoms present
- Large tongue with or without hyperactivity
- Hyperactive gag reflex

Do class IV pts need surgery

almost always

in what patient type does the residual ridge offer no resistance to horizontal or vertical movment

type D, maxilla, class IV

In what class IV pt does Location of muscle attachments have significant influence on denture base stability and retention—

type D and E mandible

what are some major conditions that require preprosthetic surgery

Implant placement (complex)—augmentation required

☐ Surgical correction of dentofacial deformities

☐ Hard tissue augmentation

☐ Major soft tissue revision, i.e., vestibular extensions with or without soft tissue grafting

☐ History of paresthesia or dysensthesia

☐ Insufficient interarch space with surgical correction required

☐ Acquired or congenital maxillofacial defects

what is a refractory pt?

a patient who has chronic complaints following appropriate therapy. These patients

continue to have difficulty in achieving their treatment expectations despite the thoroughness or frequency of the treatment provided.

would we err on the side of more or less complex when classifying edentulous pt

☐ In those instances when a patient's diagnostic criteria are mixed between two classes, any single criteria of a more complex class will move the patient into that respective class.

Classification system for completely edentulous patients

The American College of Prosthodontists (ACP), has developed a classification system for complete edentulism based on diagnostic findings. These guidelines may help practitioners determine appropriate treatments for their patients. Four categories are defined, ranging from Class I to Class IV, with Class I representing an uncomplicated clinical situation and a Class **IV** patient representing the most complex and higher-risk situation. Each class is differentiated by specific diagnostic criteria. This system is designed for use by dental professionals who are involved in the diagnosis of patients requiring treatment for complete edentulism.
Potential benefits of the system include:

1. Better patient care.
2. Improved professional communication.
3. More appropriate insurance reimbursement.
4. A better screening tool to assist dental school admission clinics.
5. Standardized criteria for outcomes assessment.

Completely edentulous patients exhibit a broad range of physical variations and health concerns. Classifying all edentulous patients as a single diagnostic group is insensitive to the multiple levels of physical variation and the differing treatment procedures required to restore function and comfort. A graduated classification of complete edentulism has been developed that describes varying levels of loss of denture supporting structures.
Complete edentulism defines as follows: the physical state of the jaw(s) following removal of all erupted teeth and the condition of the supporting structures available for reconstructive or replacement therapies.

Development of the classification system:

A review of the prosthodontic literature was used to identify the many variables associated with complete edentulism. These variable were differentiated into four subclasses:

1. Physical findings.

2. Prosthetic history.
3. Pharmaceutical history.
4. Systemic disease evaluation.

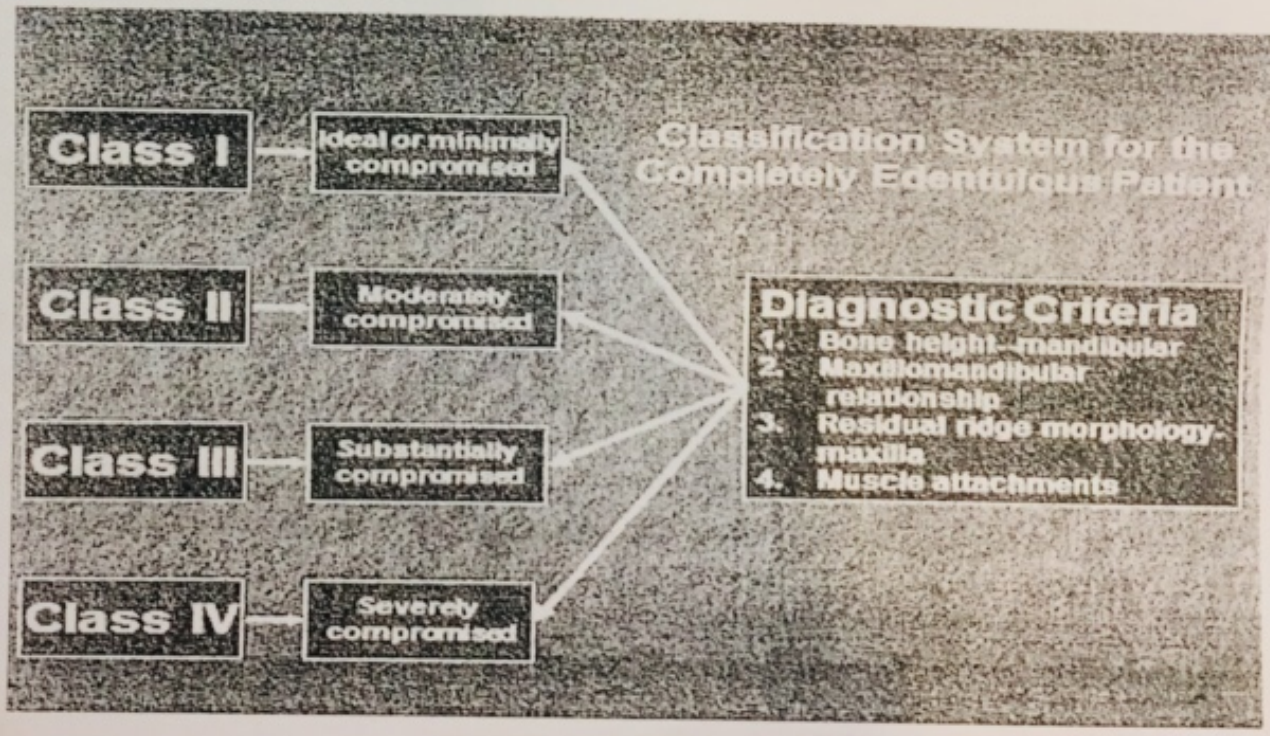
A classification system was developed based on the most objective variables. The classification system will be subject to monitoring and revision as new diagnostic and treatment information becomes available in the literature.

Diagnostic Criteria

The diagnostic criteria are organized by their objective nature and not in their rank of significance. Because of variations in adaptive responses, certain criteria are more significant than others. However, objective criteria will allow for the most accurate application of the classification system and measurement of its efficacy.

The diagnostic criteria used in the classification system are:

1. Bone height-mandible.
2. Maxillomandibular relationship.
3. Residual ridge morphology-maxilla.
4. Muscle attachments-mandible.



Bone height-mandible only:

The identification and measurement of residual bone height is the most easily quantified objective criterion for the mandibular edentulous ridge. In addition, it represents a measurement of the chronic debilitation associated with complete edentulism in the mandible. Despite the lack of a known etiology, it has been established that the loss of denture supporting structures does occur. Atwood's description in 1971 of alveolar bone loss is still applicable today: "Chronic progressive, irreversible and disabling process probably of multifactoral origin. At the present time, the importance of various cofactors is unknown." The continued decrease in bone volume affects:

1. Denture-bearing area.
2. Tissues remaining for reconstruction.
3. Facial muscle support/attachment.
4. Total facial height.
5. Ridge morphology.

The results of a radiographic survey of residual bone height measurement are affected by the variation in the radiographic techniques and magnification of panoramic machines of different manufacturers.
To minimize variability in radiographic techniques, the measurement should be made on the radiograph at that portion of the mandible of the least vertical height. The values assigned to each of the four types listed below are averages that historically have been used in relation to preprosthetic surgical procedures. A measurement is made and the patient is classified as follows:

Type I (most favourable): residual bone height of 21mm or greater measured at the least vertical height of the mandible.

Type II: residual bone height of 16 to 20 mm measured at the least vertical height of the mandible.

Type III: residual alveolar bone height of 11 to 15mm measured at the least vertical height of the mandible.

Type IV: residual vertical bone height of 10 mm or less measured at the least vertical height of the mandible.

Residual ridge morphology-maxilla only:

Residual ridge morphology is the most objective criterion for the maxilla, because measurement of the maxillary residual bone height by radiography is not reliable." The classification system continues on a logical progression, describing the effects of residual ridge morphology and the influence of musculature on a maxillary denture.

Type A (most favorable):

1. Anterior labial and posterior buccal vestibular depth that resists vertical and horizontal movement of the denture base.
2. Palatal morphology resists vertical and horizontal movement of the denture base.
3. Sufficient tuberosity definition to resist vertical and horizontal movement of the denture base.
4. Hamular notch is well defined to establish the posterior extension of the denture base.
5. Absence of tori or exostoses.

Type B:

1. Loss of posterior buccal vestibule.
2. Palatal vault morphology resists vertical and horizontal movement of the denture base.
3. Tuberosity and hamular notch are poorly defined, compromising delineation of the posterior extension of the denture base.
4. Maxillary palatal tori and/or lateral exostoses are rounded and do not affect the posterior extension of the denture base.

Type C:

1. Loss of anterior labial vestibule.
2. Palatal vault morphology offers minimal resistance to vertical and horizontal movement of the denture base.
3. Maxillary palatal tori and/or lateral exostoses with bony undercuts that do not affect the posterior extension of the denture base.
4. Hyperplastic, mobile anterior ridge offers minimum support and stability of the denture base.

5. Reduction of the post malar space by the coronoid process during mandibular opening and/or excursive movements.

Type D:

1. Loss of anterior labial and posterior buccal vestibules.
2. Palatal vault morphology does not resist vertical or horizontal movement of the denture base.
3. Maxillary palatal tori and/or lateral exostoses"(rounded or undercut) that interfere with the posterior border of the denture.
4. Hyperplastic, redundant anterior ridge.
5. Prominent anterior nasal spine.

Muscle Attachments: Mandible only

The effects of muscle attachment and location are most important to the function of a mandibular denture. These characteristics are difficult to quantify. The classification system follows a logical progression to describe the effects of muscular influence on a mandibular denture. The clinician examines the patient and selects the category that is most descriptive of the mandibular muscle attachments.

Type A (most favorable):

1. Attached mucosal base without undue muscular impingement during normal function in all regions.

Type B:

1. Attached mucosal base in all regions except labial from canine to canine.
2. Mentalis muscle attachment near crest of alveolar vestibule ridge.

Type C:

1. Attached mucosal base in all regions except anterior buccal and lingual vestibules-canine to canine.
2. Genioglossus and mentalis muscle attachments near crest of alveolar ridge.

Type D:

1. Attached mucosal base only in the posterior lingual region.
2. Mucosal base in all other regions is detached.

Type E:

No attached mucosa in any region.

Maxillomandibular Relationship

The classification of the maxillomandibular relationship characterizes the position of the artificial teeth in relation to the residual ridge and/or to opposing dentition. Examine the patient and assign a class as follows:

Class I (most favorable):

Maxillomandibular relation allows tooth position that has normal articulation with the teeth supported by the residual ridge.

Class II:

Maxillomandibular relation requires tooth position outside the normal ridge relation to attain esthetics, phonetics, and articulation (e.g., anterior or posterior tooth position is not supported by the residual ridge; anterior vertical and/or horizontal overlap exceeds the principles of fully balanced articulation).

Class III:

Maxillomandibular relation requires tooth position outside the normal ridge relation to attain esthetics, phonetics, and articulation (i.e. cross bite-anterior or posterior tooth position is not supported by the residual ridge).

Integration of Diagnostic Findings

The previous four sub classifications are important determinants in the overall diagnostic classification of complete edentulism. In addition, variables that can be expected to contribute to increased treatment difficulty are distributed across all classifications according to their significance.

Arrangement of artificial teeth in abnormal jaw relations: Maxillary protrusion and wider upper arch (class II jaw relation).

Arrangement of anterior teeth in maxillary protrusion.

As the upper arch in these situations is further forward in the anterior region, the first problem is that of an excessive amount of overjet (horizontal overlap) which results in an abnormal upper and lower canine tooth relationship. No attempt should be made to reduce this

horizontal overlap by moving the upper anterior teeth palatally or the lower anterior teeth labially.

Management:

The management of such situation can be attempted in any of the following ways, depending upon the severity of the maxillary protrusion.

1. If the protrusion is not too extreme, the simplest way is to select the lower anterior teeth of a narrower mesiodistal width and try to achieve the normal canine relationship.
2. If esthetics permit, a little crowding of the lower anterior teeth by overlapping may solve the problem well.
3. Another solution which is effective at times is leave slight spaces between the upper anterior teeth to attain normal canine relations. However, such a procedure is esthetically limited.
4. In situations where the discrepancy is not too great, grinding of the distal surface of lower canine is sufficient to restore the normal canine relationship.
5. In situations where the discrepancy is excessive and cannot be managed by the manipulation and modification of the lower anterior teeth, the lower anterior teeth must be left as they are, and the lower first premolars must be eliminated from the dental arch.

Arrangement of posterior teeth when the upper jaw is wider as in class II jaw relation:

In this situation, the lower crest of the ridge in the posterior region is lingual to the upper residual ridge. This relationship is not very common, but when present, it may give rise to considerable difficulty in the placement of upper and lower teeth in their correct occlusal relationship. In such instances, the upper arch is wider than the lower, and if the upper teeth are placed on the crest of the ridge, they will make inadequate occlusal contact with the correctly placed lower teeth. At the same time, if an attempt is made to occlude the lower teeth with the correctly placed upper teeth, the lower teeth will place too far buccally leading to an instability of the lower denture. This is much more detrimental as the lower denture-bearing area is already very small.

MANAGEMENT. The following methods of correction may be employed:

(1) If the discrepancy is very slight, the upper teeth are moved slightly in a

palatal direction to provide a working occlusal contact with the lower teeth. However, such a procedure has a very limited application as the upper posterior teeth cannot be moved inside (palatally) to any great extent without affecting phonetics and cheek support.

(2) If the upper arch is much wider than the lower one, any of the following methods can be used successfully:

(a) The lower posterior teeth are correctly placed on the crest of the ridge. The upper teeth are then set so that they occlude well with the lower teeth. Then the buccal contours are built on the upper teeth in wax which is later replaced by tooth-colored acrylic resin to fulfill esthetic requirements and to provide support for the cheek.

(b) Another method can be used alternatively for the same problem. The upper posterior teeth are arranged first to meet the requirements of esthetics. The lower teeth are kept on the crest of the ridge. This will result in an unfavorable occlusal relationship of the upper and lower posterior teeth. In order to establish a functional occlusal contact between the upper and lower posterior teeth, wax is added on the palatal aspect of the upper posterior teeth. This wax is later replaced by tooth colored acrylic resin. This gives a functionally effective occlusal contact as well as an esthetically acceptable buccal surface contour of the upper posterior teeth. Nonanatomical posterior teeth are best for these procedures as they allow more freedom in their buccolingual placement.

Arrangement of artificial teeth in abnormal jaw relations: Mandibular protrusion and wider lower arch (class III jaw relation):

Arrangement of anterior teeth in mandibular protrusion.

This condition is characterized by the lower anterior ridge being forward in relation to the maxillary ridge .This may vary from edge-to-edge relation (where both upper and lower ridges are at the same level) to a marked prognathism (in which the lower ridge is forward in relation to the upper ridge).

MANAGEMENT. These situations can be managed by any of the following methods, depending upon the severity of the mandibular protrusion.

(1) If the ridges are in an edge-to-edge relation, the incisal edges of the upper and lower incisors and cuspids will also meet in edge-to-edge relationship .The upper and lower teeth are placed as near as possible to

the labial plates of bone in their respective ridges. No attempt should be made to introduce normal horizontal overlap if the ridge relation does not permit it.

(2) With an extreme protrusion of the mandible, a negative or reverse horizontal labial overlap must be used. The lower anterior teeth are placed labial to the upper anterior teeth. The magnitude of the reverse horizontal overlap depends upon the amount of protrusion of the lower residual ridge.

(3) If the difference in ridge size is too great, one of the following methods may be used to solve the problem.

(a) Use a slightly larger lower-tooth mold than that suggested for normal use with the upper teeth. This will compensate for the greater lower-arch width. This is the simplest method.

(b) Use a slight overlapping in the upper anterior teeth, if esthetically acceptable. This will automatically narrow the lower-arch space and may eliminate spacing.

(c) Use an extra lower incisor to avoid the spaces. However, this is hardly an acceptable measure. It is better, esthetically, to leave some spaces between the lower anterior teeth than for the dentures to appear to have too many teeth.

The relationship of the upper and lower canines in this situation does not present much of a problem. The lower anterior teeth are set in a forward relation to the upper anterior teeth. The distal surface of the lower canine coincides with the tip of the upper canine. If it finishes mesial to the canine tip, the discrepancy can be rectified by using small spaces between the lower anterior teeth so that the canine teeth will have their normal relationship.

Arrangement of posterior teeth when the lower arch is wider:

MANAGEMENT:

An arrangement for the posterior cross-bite relationship will depend on the severity of its deviation from normal. One of three procedures may be used.

(1) If the difference in size is slight and the upper ridge is well formed, the upper posterior teeth can be set slightly buccal to the crest of the upper ridge in such a position that correctly placed lower posterior teeth can make effective occlusal contacts with their antagonists. This should not be done to an extent that it introduces potential midline fracture in the upper denture.

(2) Nonanatomical teeth may be used. These teeth allow more freedom in their buccolingual placement and still provide an adequate occlusal contact between the upper and lower teeth. The teeth can still be kept on the crests of the respective ridges without losing the desired occlusal contacts.

(3) If the lower arch is too wide and cannot be managed otherwise, an interchange can be accomplished by using upper teeth on the lower denture and lower teeth on the upper denture. The interchange is made across the arch as well. The right upper teeth are placed on the left lower ridge, and left lower teeth are placed on the right upper ridge. Similarly, the left upper posterior teeth are set on the right lower ridge, and right lower posterior teeth are placed on the left upper ridge. Start by placing the lower teeth on the upper ridge. As the upper arch is already smaller in these patients, it is imperative that the first premolar tooth be eliminated from the arch to develop correct intercuspal relationships. The second premolar, first molar, and second molar (lower teeth) are set on the upper ridge. The buccal cusps of these teeth correspond to the guideline of the lower occlusal rim.

Sometimes a cross-bite setting (i.e., a reverse horizontal buccal overlap) is suggested without interchanging the teeth between the two arches. The success of such an arrangement of teeth is doubtful, as anatomically they are not meant to intercuspate with each other in this relationship. However, it might be attempted if nonanatomical posterior teeth are used.

Retention, stability and support of complete denture

Dr. Raghdaa Kareem Jassim

Lec: 13

Retention:

Is the quality of a denture that resists movement away from the tissue.

Factors affect in the retention of CD

1) Physical factors.
2) Anatomical factors.
3) Mechanical factors.
4) Muscular factors.
5) Surgical factor.

I- Anatomical factors :

The various anatomical factors that affect retention are:

Size of the denture bearing area, quality of the denture bearing area

It mainly affect lower denture

1- Ridge form:

1) High and flat crest and well formed in recent extraction. The problem only is no space for setting of teeth
2) Flat one difficult and no retention and stability so in taking the impression try to extend it beyond mylohoid area to gain more stability and retention.
3) Ridge with undercut more common in upper(bilateral maxillary tuberosity) so we do surgery in one side and block out the other and we have to change the path of insertion.
4) Knife ridge difficult and cause lacerations and pain so we do relief.
5) Flabby ridge fibrous tissue and movable, no good seal so we either modified in the impression technique or do surgical correction.

2- Volt Form:

1) - U shaped >>> good in retention and stability.

2) - V shaped >>> have retention but no stability and any pressure on it could break the seal .

3- flat shaped no enough depth, so no retention and stability .

3- Arch Form:

Squared, ovoid, tapered and the best one is the squared. This is because of:-

1-there is 4 point of contact with denture.

2-Resistant the lateral forces.

4- Arch relationship

Most of edentulous patient have class III >>> because of the pattern of bone resorption of the ridges. So the limited in movement only opening and closing. (No protrusive movement)

Some have class II and it isn't favorable because it have small surface area, and difficult to get the upper and lower in contact.

5- Interach distance: Small interarch space more retention
6- Tongue:If too big >> it could interfere with denture.So dislodging of the lower and upper.
7- Mucosa: We need it Firm, compressible and even thickness. Not to be thick and flabby.

II- Physical factors
***1*- Adhesion:**
It's a physical attraction between unlike molecule like the contact of saliva to both oral tissue and denture base
The amount of retention provided by adhesion is depend on

1- **Close adaptation of the denture base**
2- **type of saliva (viscosity and wet ability)**Thin serous saliva provide better adhesion than thick ropy saliva , it builds up pressure & pushes the denture out of position
3- **Area cover by the denture.** The size of maxillary denture bearing area is about (24 cm^2) & that of mandible is about (14 cm^2)

Mandibular foundation has decreased surface area and hence decreased adhesion.V shaped palate induces sliding or deflection, hence retention by adhesion is less.

2- Cohesion: Its physical attraction between Like molecules.

Factor affecting cohesion:

1. **Area covered by the denture** (cohesion is directly related to the area covered by denture if all the factor are equal)
2. **Thickness of the salivary film** (saliva film should be thin , watery serous saliva can form a thinner film and is more cohesive than thick mucous saliva
3. **Adaptation to denture base to mucosa** (close adaptation of denture to the mucosa is needed so that only a thin of saliva is present.
4. **Interfacial surface tension:** A property of liquids in which the exposed surface tends to contract to the smallest possibly.

To obtain maximum interfacial surface tension

1. Saliva should be thin and even
2. Perfect adaptation should be present between the tissues and denture
3. The denture base should cover a large area.

4. There denture should have good adhesive and cohesive force to aid to the enhancement of interfacial surface tension

4- Capillary attraction

It defined as "the quality that causes elevation or depression of the surface of the liquid that is in contact with the solid".

Factors that aid to improve capillary attraction;

1) Close adaptation of denture base to soft tissue. Greater the distance less the capillary force

2) Greater the size of the denture bearing area greater the Capillary attraction retention

5) Atmospheric pressure and peripheral seal

When a dislodging force is applied on the denture having good border seal, a negative pressure develops in the space created between the denture base and the mucous membrane. When the negative pressure develops inside, the atmospheric pressure from outside pushes the denture towards the basal seat helping in retention of the denture

Factor affecting atmospheric pressure

a) Closeness of adaptation to keep air out of tissue contact depends mainly on the 1) impression technique. 2) An impression material that places slight generalized pressure on soft tissue is preferred.

3) Proper border molding

b) Peripheral seal

Is defined as the area of contact between the mucus membrane & peripheral polished surface of denture base

To have good peripheral seal

c) Posterior palatal seal area

It is defined as "The soft tissue at or along the junction of the hard and soft palates on which pressure within the Physiological limits of the tissues can be applied by the denture to aid in the retention of the denture.

The shape of posterior palatal area depends on the shape of palate. According to house classification:

1) Class 1 flat - Wide palatal vault in the hard palate so the shape of posterior palatal seal is butter- flay 3-4 mm in width and Width 1.5 depth

2) Class ll intermediate

3) Class lll deep-high vault so the shape of PPS is beed 1mm in depth Width 1.5 depth .

Function of the posterior palatal

1) Aids in retention by maintaining constant contact with the soft palate during functional movements like speech mastication and deglutition.

2) Reduce the tendency for gag reflex as it prevents the formation of the gap between the denture base and soft palate during functional movements.

3) Prevent food accumulation between the posterior border of the denture and the soft palate

4) Compensates for polymerization shrinkage

6) Gravity

Gravity acts as retentive forces for the mandibular denture and displacement for the maxillary denture when patient is in upright posture

7)Viscosity

Is the resistance to flow of fluid resulting from intermolecular forces acting within the fluid. Fluid having a high viscosity resist flow more effectively than those of lower viscosity.The additional saliva will cause loss of retention of the denture because of the resultant increase in distance between the denture &mucosa

8.Wettability

For adhesion to be accomplished between a solid & fluid, Wetting of solid by fluid must take place .

The degree to which this occur depend on relative surface tension .The wetting characteristics may be described in terms of contact angle (high contact angle indicate poor wetting).

III- MECHANICAL FACTORS :

The varicose mechanical factors which aid in retention are:

1) Undercuts
2) Magnetic force
3) Denture adhesion
4) Suction chambers and suction discs

1- Engagement of undercut:

Unilateral undercuts aids in retention while bilateral undercuts will interfere with denture insertion and require surgical correction.

If bony undercuts exist, retention may be enhanced by designing a denture that utilizes these undercut areas. In order to achieve this without traumatizing the mucosa" on insertion and removal of the denture, special care is required in planning the path of insertion

2- Magnets.

Intramucosal magnetic aid in increase retention of highly resorbed ridge.

Magnetic attachments can significantly improve the retention of mandibular complete over denture.

The location of magnetic attachments greatly influences the retentive force of the over denture

Indication:

Some metal alloys possess magnetic properties which can be utilized in the retention of over dentures or partial dentures.

3- Denture adhesive:

Indications:

1-Denture adhesives are indicated when well-made complete dentures do not satisfy a patient's perceived retention and stability expectations.
2-Patients who suffer from xerostomia.
3- Neurological diseases like stroke and Orofacial dyskinesia
4-Patients who have undergone extensiv surgery for removal of Oral Neoplasia

Contraindication

1-Adenture adhesive should not be used for patient with ill- fitting dentures
2- It should not be used with patient with worn out denture.
3- t- It should not be used as a substitute to a relinering or tissue conditioner.
4-it should not be used for patient with physical inability to clean dentures.
5-It should not be used in patient with temporary or immediate dentures where infections could result.
6- It should not be used in patient allergic to adhesive

Mode of action of adhesives:

Mechanism of action: its enhance retention through the optimizing interfacial forces by :

1. Increasing the adhesive and cohesive properties and viscosity of the interposed medium
2. Eliminating the voids between denture base and its basal seat
3. Increases viscosity of saliva
4. Hydrated material swells up in the presence of saliva /water
5. Hydrated material formed by adhesives stick readily to the tissue surface and the mucosal surface of the denture

Forms of denture adhesive

A- Powder form

Start its action immediately with maximum effectiveness &decrease with time.

B- Cream form

Starts its action immediately with accepted effectiveness which increases to maximum within Time

Side effect of denture adhesive:

- High or Elevated Zinc Blood Levels.
- Symptoms of Nerve Damage.
- Numbness or Tingling in the Arms and Legs Paresthesia.
- Anemia
- Bone Marrow Failure

4- Vacuum device

-It's like a suction chamber Alternative name is rubber disk or palatal window in the past suction chamber in the maxillary dentures were used to aid in retention by create an area of negative pressure which increase retention .

They are avoided now due to their potency for creating palatal hyperplasia

IV MUSCULAR FACTOR

The oral and facial musculature supply supplementary retentive forces, provided

1) The teeth are positioned in the "neutral zone" between the cheeks and tongue and

2) Polished surfaces of the dentures are properly shaped.

For the oral and facial musculature to be most effective in providing retention for complete dentures, the following conditions must be met:

(1) The denture bases must be properly extended to cover the maximum area possible, without interfering in the health and function of the structures that surround the denture;

(2) The occlusal plane must be at the correct level.

(3) The arch form of the teeth must be in the "neutral zone" between the tongue and the cheeks.

The muscles affected on retention are:

A- Buccinators

B- orbicularis oris

C- muscle of tongue

The accurate approximation of tongue, cheeks and lip to a denture controls the flow of saliva under the denture, thereby increasing the effective area of retention.

In accurate extension of denture may allow increased saliva and air to enter under the denture & cause loss of retention.

Active muscle fixation of dentures may be obtained by careful attention to the form of those surfaces which contact their environmental tissue

Denture surface:

1) Occlusal surface

2) Polished surface

3) Impression surface

Occlusal surface:That portion of the surface of a denture which makes contact or near contact with the corresponding surface of the opposing denture or dentition) .

Polished surface:It is that part of the denture base which is usually polished, includes the labial, buccal and lingual surfaces of the teeth, and is in contact with the lips, cheeks and tongue. Proper contour & design of the polished surfaces should be in harmony with the function of tongue & cheeks to keep the denture in its position

Craddock described the gripping action of the buccinators muscle on the buccal flange of the mandibular denture

If the buccal flanges of the maxillary denture slope Up & out from the occlusal surfaces teeth & the buccal flanges of the mandibular denture slope down &out from the occlusal plane, the contraction of the buccinators will tend to seat both dentures on their basal seats

Impression surface: That portion of the surface of a denture that had its shape determined by the impression. It includes the borders of the denture and extends to the polished surface. The lingual surfaces of the lingual flanges should slope toward the center of the mouth so the tongue can fit against them & perfect the border seal on the lingual side of the denture.

Lingual flanges turn laterally in posterior part toward the ramus. Also helps ensure the border seal at the back end of mandibular denture."

V Surgical factors

1) Vestibuloplasty 2) Tuberoplasty 3) Ridge augmentation

STABILITY

that quality of maintaining a constant position in the presence of **forces** that threaten it; The quality of a denture to be firm, stable or constant and to resist displacement by **functional stresses** & not to be subject to change of position when forces are applied.

The various factors that affecting the stability are:

1-Vertical height of the residual ridge
2-Quality of the impression
3-Occlusal rims
4-Arrangement of the teeth
5-Contoure of the polish surface
6- Shape of the palatal Vault
7- Retention
8- Proper relief

Width of the occlusal table >>must be less than normal teeth >> to get god stability and retention.

1) Vertical height of the residual ridge

The residual ridge should have sufficient vertical height to obtain good stability .Highly resorbed ridges offer the least stability.

2) Quality of the impression:

An impression should be as accurate as possible. The impression surface should be smooth and duplicate all the details accurately.

It should be devoid of voids and any rough surfaces. The impression should not warp on removal. The impression should be dimensionally stable and the cast should be poured as soon as possible.

3) Occlusal plane;

The occlusal plane should be oriented parallel to the ridge .if the occlusal plane is inclined then the sliding force may act on reduce its stability. The occlusal plane should divide the inter arch space equally

4) Teeth arrangement (balanced occlusion and neutral zone):

The position of the teeth and their occlusion play an important role in the stability of the denture .Balanced occlusion facilitates the even distribution of force across the denture. Absence of the balanced occlusion may produce unbalanced lever type of force of any one side of the denture leading to loss of stability.

The teeth in the denture should arrange in the neutral zone.

Neutral zone: the potential space between the lips and cheeks on one side and the tongue on the other.

Natural or artificial teeth in this neutral zone are subjected to equal and opposite force from the surrounding musculature""

5) Contour of the polished surface;

The polish surface of the denture should be harmonious with the oral structures. They should not interfere with the action of the oral musculature.

6) Shape of palatal vault

A steep palatal vault may enhance stability by providing greater surfaces area of contact & long inclines approaching .a right angle to the direction of force

Hard palate:

Hard palate can be classified as :

1 -U-shaped: ideal for both retention and stability.

2-V-shaped: retention is less as the peripheral seal is easily broken.

3-roundt: reduced resistance to lateral and rotator force

Stability decrease with

1-Loss of vertical height of the ridge,

2- Increase in the movement of flabby tissue.

Support

The resistance to the forces of mastication, occlusal forces & other forces applied in a direction towards the denture bearing area.

The resistance to vertical forces of mastication, occlusal forces & other forces applied in a direction towards the denture bearing area.

Initial denture support is achieved by using impression procedure that provide optimal extension & functional loading of the supporting tissue

Nature of the Supporting tissue

The soft tissues should be

1-. In the edentulous person, the mucosa covering the hard palate and the crest of the residual ridge, including the residual attached gingiva, is classified as masticatory mucosa. It is characterized by a well-defined keratinized layer on its outermost surface that is subject to changes in thickness depending on whether dentures are worn and on the clinical acceptability of the dentures

2-the submucosa is firmly attached to the periosteum of the underlying supporting bone and will usually withstand successfully the pressures of the dentures.

(The thickness and consistency of the submucosa are largely responsible for the support that the mucous membrane affords a denture because in most instances, the submucosa makes up the bulk of the mucous membrane. When the submucosal layer is thin, the soft tissues will be nonresilient, and the mucous membrane will be easily traumatized. When the submucosal layer is loosely attached to the periosteum or it is inflamed or edematous, the tissue is easily displaceable, and the stability and support of the dentures are adversely affected.).

3- Covered by keratinized mucosa.

Hard tissue should be

Relatively resistance to remodeling & resorptive changes.

Consideration must be given to the maintenance of alveolar ridge height in the conventional complete denture patient.

Minimizing the pressure in those region most susceptible & directing the forces toward those region relatively resistance to resorption can maintain healthy residual ridge.

There are two types of osseous tissue that form bones.

Cortical bone: It is harder, stronger and stiffer than cancellous bone

Cancellous bone: is less dense, softer, weaker, and less stiff. It typically occurs at the ends of long bones,

Mandibular anatomical consideration:

1-Buccal shelf area

The surface of the mandible from the residual alveolar ridge or alveolar ridge to the external oblique line in the region of the lower buccal vestibule. It is covered with cortical bone.

Buccal shelf area is the primary support area for the mandibular denture because

1) it's usually covered by mucosa with an intervening sub mucous layer containing glandular connective tissue & buccinators muscle fibers

2) It is parallel to occlusal plan.

3) It lined by cortical bone.

MANDIBULAR RESIDUAL RIDGE

It is covered by a keratinized layer and is attached by its submucosa to the periosteum of the mandible. The extent of this attachment varies considerably. In some people, the

submucosa is loosely attached to the bone over the entire crest of the residual ridge and the soft tissue is quite movable. In others, the submucosa is firmly attached to the bone on both the crest and the slopes of the lower residual ridge.
The ridges crests are reserved as secondary support areas.
1) The lack of the muscle attachment 2) Presence of cancellous bone

MAXILLARY ANA TOMIC CONSIDERATION

1) Horizontal portion of the hard palate is consider as primary stress bearing area
-It have keratinized masticator mucosa overlies a distinct Sub mucosa layer everywhere

2) ***In the region of the medial palatal suture,*** the submucosa is extremely thin, with the result that the mucosal layer is practically in contact with the underlying bone. For this reason, the soft tissue covering the medial palatal suture is nonresilient and may need to be relieved to avoid trauma from the denture base.

3) In the area of the rugae, the palate is set at an angle to the residual ridge and is rather thinly covered by soft tissue. This area contributes to the stress-bearing role, though in a secondary capacity. The submucosa covering the incisive papilla and the nasopalatine canal contains the nasopalatine vessels and nerves

4) CREST OF MAXILLARY RIDGE

The crest of the edentulous ridge is an important area of support. However, the bone is subject to resorption, which limits its potential for support, unlike the palate, which is resistant to resorption. Because of this, the ridge crest should be looked on as a secondary supporting area, rather than a primary supporting area. The inclined facial surface of the maxillary ridge provides little support,
Although the peripheral tissues should be contacted to provide a border seal
The configuration of the bone that provides the support for the maxillary denture varies considerably with each patient.

Factors that influence the form and size of the supporting bone include

(1) Its original size and consistency;
(2) The person's general health;
(3) Forces developed by the surrounding musculature;
(4) The severity and location of periodontal disease (a frequent cause of tooth loss).
(5) Forces accruing from the wearing of dental prostheses.
(6) Surgery at the time of removal of the teeth.
(7) The relative length of time different parts of the jaws has been edentulous. In addition, a number of anatomical features influence the shape of the hard palate and residual ridge.

Methods used for improving the retention stability and support,These are described in the following .

- Dental implants improve the support, retention and stability of a full or partial denture reducing the slip and movement while speaking or eating

- Mini-implants have become a common treatment option for improving retention of lower dentures

Clinical evaluation of retention staability ??????

Lec. 14

SINGLE COMPLETE DENTURE

ا م د رغداء كريم جاسم

The construction of a single denture may be presented in a variety of dental combinations. It could be:

1- Single complete denture opposing Natural teeth. which either:
   a) Upper complete opposing by complete mandibular dentition
   b) Upper complete opposing by mandibular partial denture
   c) Lower complete opposing by upper partial denture
   d) Lower complete opposing by complete maxillary dentition
2- Single complete denture opposing previously constructed complete denture

The single complete maxillary denture opposing all or some of the mandibular natural teeth is a very common clinical situation

Maxillary complete opposing by complete mandibular dentition

With this case

- a gross occlusal discrepancy are very common and require occlusal modification, adjustment or orthodontic.
- Morphology of natural teeth which determine the selection of artificial teeth .Ex size& shape.
- If mandibular teeth are attrited 0 .cuspless teeth are preferred.
- If mandibular teeth are not attrited, anatomic teeth are preferred.

OCCLUSAL MODIFICATION: occlusal modification of remaining natural teeth is usually required prior to construction of single complete denture .it is a pre prosthetic procedure where occlusal discrepancy present in natural teeth are corrected.

Several techniques could be used to determine occlusal modifications that are necessary prior to denture construction:

1- (Yurkstas technique); Use of a commercially available U shaped metal occlusal template that is slightly convex on the lower surface. This template is often an aid in detecting minor deviations in the occlusal scheme

2- (Swenson's technique) Upper and lower casts are mounted on the articulator. The upper denture is constructed. If the lower natural teeth interfere with the placement of the denture teeth, they are adjusted on the cast and the area is marked with a pencil. The natural teeth are them modified using the marked diagnostic cast as a guide. This technique is simple but time consuming.

3- (Bruce technique) Use of a clear acrylic resin template fabricated over the modified stone cast. The inner surface of the template is coated with pressure indicating paste and placed over the patient's natural teeth.

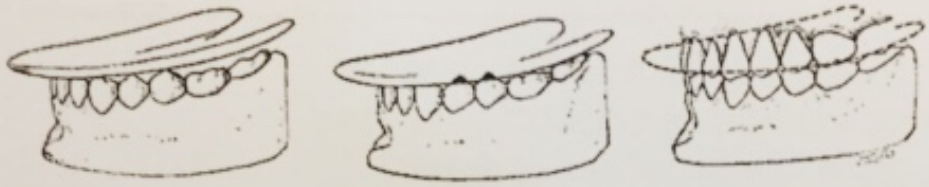


Figure showing Yurkstas techniques

Upper complete opposing by mandibular partial denture

These denture are very significant due their complications, teeth selection is very important in fabrication of denture.so selection of teeth based on the following:--

- If opposing partial denture has porcelain teeth, porcelain teeth are preferred
- If opposing natural teeth have gold or metal crown, then acrylic teeth preferred.
- Acrylic teeth are preferred in denture opposing normal natural teeth or partial denture with artificial acrylic teeth.

Complications

a) Combination syndrome
b) Fracture of denture
c) Wear of natural teeth

a.Combination Syndrome and Associated Changes (Kelly's Syndrome)

A Combination Syndrome by Kelly (1972): destructive problems, which may be encountered as a result of long term use of a mandibular distal extension partial denture against a complete maxillary denture.

Pathogenesis

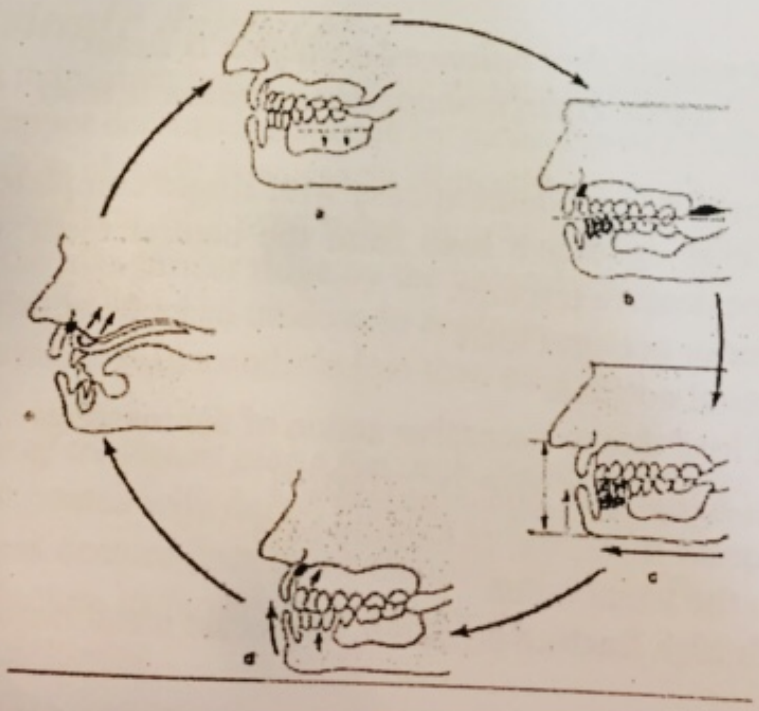
Sequence 1:-

- the patient will tend to concentrate the occlusal load on the remaining natural teeth (mandibular anterior)for proprioception. Hence there is more force acting on the anterior portion of the maxillary denture.
- this leads to increased resorption of anterior part of maxilla which gets replaced by flabby tissue. the occlusal plane gets tilted anteriorly upwards and posteriorly downwards due to lacks of anterior support.
- The labial flange will displace and irritate the labial vestibule leading to the formation of epulis fissurstum.

- Posteriorly there will be fibrous over growth of the tissue in the maxillary tuberosity.
- The shift of the occlusal plane posteiorly down ward produced resorption in the mandiblular distal extension denture bearing area.
- Due to the tilt of occlusal plane shift anteriorly during occlusion.
- The vertical dimension decreased. the retention and stability of the denture is also decreased
- The tilt of occlusal plane disoccludes lower anterior causing them to super-erupt this reduces the periodontal support of the anterior teeth.
- The shift of the occlusal posteriorly down ward produces resorption in the mandibular distal extention denture bearing area.
- Due to the tilt of occlusal plane dissoccludes the mandible shift anteriorly during occlusion.
- The supra erupted anteriors increase the amount of force acting on the anterior part of the complete denture and the vicious cycle continues

Seqence 2

- There is gradual resorption of the distal extension residual ridge in the mandible .
- This leads to tilting of the occlusal plane posteriorly downwards and anteriorly upwards
- Rest of vicious cycle continues as shoun in figure



This syndrome consists of:

1. Loss of bone from the maxillary anterior edentulous ridge
2. Down growth of the maxillary tuberosities
3. Papillary hyperplasia of the tissues of the hard palate.
4. Extrusion of the lower anterior teeth
5. Loss of bone beneath the removable partial denture bases.

It usually has six associated changes:

1. Loss of vertical dimension of occlusion.
2. Occlusal plane discrepancy
3. Anterior spatial resorption of the mandible.
4. Development of epulis fissuratum
5. Poor adaptation of the prosthesis and,
6. Periodontal changes.

The Combination Syndrome Is a Result of Three Main Factors

- the great magnitude of forces involved,
- the unsuitability of the denture foundation to resist them
- the particularly unfavorable occlusal relationship

SETTING OF TEETH AND OCCLUSAL CONCEPT

Balanced occlusion or monoplane occlusion.

Selecting the occlusal concept depends on the occlusal anatomy of the opposing teeth :-

- *Opposing teeth anatomic then balanced occlusion is used.*
- *opposing teeth are attrited then monoplane occlusion is used*

B. fracture of Denture it is a common case with single complete .this is because the denture will receive excessive load from the natural teeth .the precipitating factors which produce denture fracture.

- Excessive anterior occlusal load.
- Deep labial frenal notches.
- High occlusal load due to excessive action of the masseter

Precaution checking for the occlusion

a) Maintain adequate thickness of denture base
b) Never deepen the labial notch
c) For cases with high fracture potential, use a cast metal denture base.

C.**Wear of Teeth** when porcelain teeth are used, sever abrasion of opposing natural teeth will occur, hence, a proper selection of teeth material is very important .care should be taken to avoid any occlusal discrepancy
Selecting the occlusal concept depends on the occlusal anatomy of the opposing natural teeth

- Opposing teeth anatomic then balanced occlusion is used.
- Opposing teeth are attrited then monoplane occlusion is used.

TYPES OF TEETH.

- PORCELAIN TEETH (problem) they cause rapid wear of opposing natural teeth and the occlusal vertical dimension is maintained.
- ACRYLIC TEETH. (problem) No wear of the opposing natural teeth, they are the teeth of choice. The major disadvantage of resin teeth is their wear, which results in loss of vertical dimension.
- ACRYLIC WITH GOLD OCCLUSAL SURFACE. In patients with the financial resources, gold occlusal can be used to minimize wear of the occlusal surfaces. Although gold occlusal are considered the best material to oppose natural teeth, BUT they are expense and need time in their fabrication.
- ACRYLIC WITH AMALGAM STOPS. In patients with limited financial resources, amalgam stops can be inserted into the cusp tips of the acrylic resin denture teeth reduce the occlusal wear, and the technique is simple less time consuming and less expensive than with the gold occlusal.

Mandibular single denture:

The prognosis of a mandibular single denture against natural teeth is less favorable than when the full upper denture is opposed by natural lower teeth
It would be difficult to classify this case as clinically successful. This is due to:

1. Excessive resorption of lower ridge due to greater stresses per unit area delivered to the mandibular ridge by the natural teeth.
2. Amount of firmly attached mucosa to denture.
3. Denture bearing area in mandible less than maxilla.

The alternative line of treatment plane for such patient could be either:

- It can be best treated with dental implant if possible
- Use of resilient denture liner in the mandibular denture.

Mandibular single denture have very poor prognosis.

Problems *of single denture:*

1. **Greater magnitude of forces** Greater magnitude of forces Changes in the underlying bone. In the long term, Denture will compromised

2. . **Occlusal form of the remaining natural teeth**: This occlusal form dictates occlusal form of the denture teeth which might be unsuitable for the denture.
3. Occlusal scheme causing more horizontal forces

These factors causes occurrence of

A. Single denture syndrome
B. loose or tilting denture- loose or tilting denture
C. -damage of mucosa-
D. ridge resorption.-

How to Overcome These Problems????????

The primary consideration for a continued success of a single complete denture is by preservation of remains tissue through the followings

- Proper diagnosis and full use of every factor, which favors success for this denture. Diagnosis and treatment planning includes:

a) Complete case history is taken and oral examination is done.
b) Studying upper and lower casts
c) The upper cast is mounted on the articulator using a face bow.
d) The lower cast is mounted on the articulator using a provisional centric interocclusal record at an acceptable vertical dimension.
e) Applying the principles of complete denture construction which includes:
   - Maximum base extension within functional anatomical limits (distributed forces over the largest possible area of supporting structures and the force per unit area kept at minimum.)
   - Lip support
   - Minimal vertical overlap (Overbite)
   - Suitable occlusion and free articulation.
   - Avoid broad inclined planes.

Steps for Single Denture construction

1) Proper Diagnosis and mounting the diagnostic casts for evaluation of

a. Ridge relationship
b. Interdental space
c. Occlusal plane
d. Spaces
e. Tooth position(Cusp inclination &Rotations)
f. Tooth wear:-With single complete dentures, the natural dentition opposing the edentulated arch often exhibits an uneven occlusal plane. Tilted teeth

2) Occlusal Adjustment and Tooth Modification

3) Final Impression. An ideal impression should provide:

a) Maximum extension without muscle impingement.
b) Intimate contact with the tissue area covered.
c) Proper form of the borders including the posterior border of the maxillary denture.
d) Proper relief of hard and sensitive areas.
4) Jaw relation.

5) Face bow transfer. Recording Intermaxillary Relations for Single Upper Denture Freely removing from the upper rim whatever quantity of wax is necessary to achieve the required degree of jaw closer. The incisal level of the upper front teeth and the occlusal plane can be determined later by reference to the lower natural teeth.

6) Artificial teeth adjustment and Try-in of waxed denture.

7) Delivery.



MAXILLOFACIAL PROSTHESIS AND MATERIALS

ا.د.رغداء كريم جاسم

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Maxillofacial Prosthetics:-the branch of prosthodontics concerned with the restoration and/or replacement of the stomatognathic and craniofacial structures with prostheses that may or may not be removed on a regular or elective basis.

Maxillofacial Prosthesis:-is an artificial device or any prosthesis used to replace part or all of any stomatognathic and/or craniofacial structure.

Maxillofacial defects may be caused by congenital malformation, trauma or surgical resection of tumor.

Indications of maxillofacial prosthesis:

1. When plastic surgery is contraindicated.
2. When recurrence of malignancy is expected.
3. When radiotherapy is being instituted, radium appliance and radium protector shield can be used.
4. Temporary maxillofacial Prosthesis can be used when plastic surgery requires various steps.

Objectives of maxillofacial prosthesis

1. Improve or restore the esthetics or cosmetic appearance of the patient which is of prime importance for everybody.
2. Improve or restore the functions that include:
   a.Speech functions in patient with palatal lost part of the jaw.
   b.Nutritional function in patient with lost part of the jaw.
   c.avoid escape of food to nasal cavity in children with cleft and overcome feeding problem.
3. Protect the tissues:
   a. To protect the adjacent tissue as in radium protective, also to protect wound, stop bleeding and carry medication after surgery.
   b. Protect the teeth as in mouth guard contact sport.
4. Therapeutic or healing effects by placement of radium applicator.
5. Physiologic therapy: to raise the moral of the patient + Help in healing fracture segments in casesof fracture face.

Essentials of maxillofacial prosthetic appliance

1.The appliance must be easily seated in place comfortably and securely as much as possible.
2.The appliance must be durabe and easily clean.
3.Thematerial must be inert and biocompatible.
4.Thematerial must be easily adjusted and altered if needed.

Maxillofacial team member

1.Plastic surgeon
2.Radiotherapist.
3.Dental specialists.

5.Oral surgeon.

6.Orthodontist.

7.Dental technician.

8. ENT specialist.

9.The psychiatrist.

10.Social workers.

11.Neurologist

12.Physiatrist.

Maxillofacial Classification

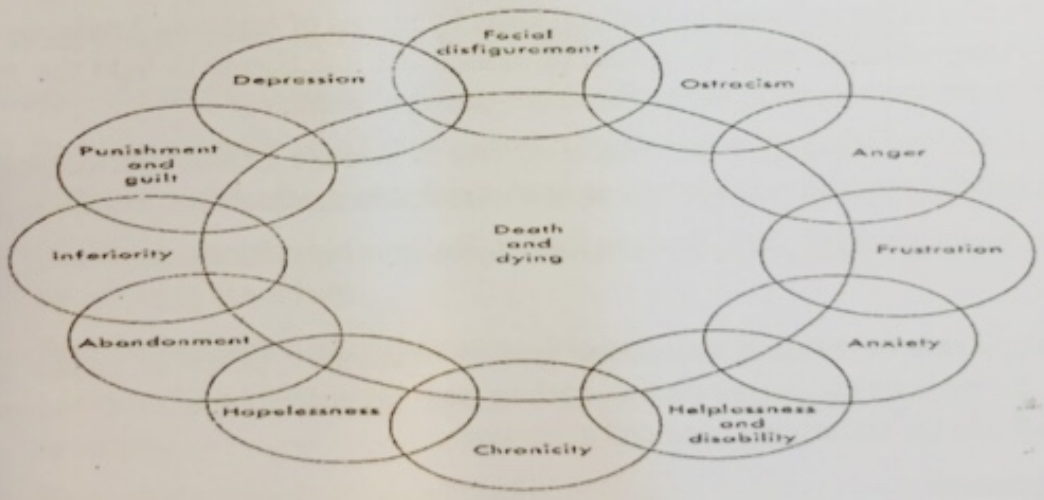
Patients can be categorized by maxillofacial defects that are

- Acquired: Include those that are the result of trauma, or of disease and its treatment. These may include a soft and/or hard palate defect resulting from removal of a squamous cell carcinoma.

- Congenital. Congenital defects are typically craniofacial defects that are present from birth. The most common of these include cleft defects of the palate that may include the premaxillary alveolus.

- Developmental. Developmental defects are those defects that occur because of some genetic predisposition that is expressed during growth and development.

Psychosocial Issues



Another helpful way to classify maxillofacial patients is by the location of prosthesis

- *Extraoral* (cranial or facial replacement).
- *Intraoral* (involving the oral cavity).
- Intraoral+Extraoral :Lost part of maxilla or mandible with facial extension

Extra Oral Appliances

1. Nasal prosthesis

2. Auricular prosthesis

3. Orbital Prosthesis

4. Radiation Carrier

5. Cranial prosthesis.

Nasal prosthesis:

A removable prosthesis attached to the skin which artificially restores part or all of the nose. Fabrication of a nasal prosthesis requires creation of original mold. Additional prostheses usually can be made from the same mold, and assuming no further tissue changes occur, the same mold can be utilized for extended periods of time.

Auricular prosthesis:

An artificial ear produced from a previously made mold. Unfortunately, the presence of hair and the absence of anatomic irregularities often result in unfavorable adhesive retention of auricular prosthesis. Endosseous implants may permit positive retention of auricular prosthesis.

Orbital Prosthesis:

- Loss of eye is emotional and physical problem to the patient.
- An orbital prosthesis is created to restore a more normal anatomical structure and cosmetic defect created by these conditions in a person. This type of restoration need retention means by implant especially when the defect is large

Cranial prosthesis:

A biocompatible, permanently implanted replacement of a portion of the skull bones.

Radiation Carrier

A device used to administer radiation to confined areas by means of capsules, beads, or needles of radiation emitting materials such as radium or cesium. Its function is to hold the radiation source securely in the same location during the entire period of treatment

Radiation oncologists occasionally request these devices to achieve a close approximation and controlled application of radiation to a tumor deemed amiable to eradication.

Synonymous :-, Radiation Applicator, Radium Carrier, Radiotherapy Prosthesis.

Carrier Stent

It is used to carry skin or mucous membrane graft in vestibule , palate or mouth floor in approximation to periosteum during initial healing and prevent formation of heamatoma between the graft and the underlying bone and periosteum.

Intra Oral Appliances

1. Obturator.
2. Feeding prosthesis
3. Mandibular prosthesis.
4. Speech prosthesis.
5. Palatal lift prosthesis.

OBTURATOR

A maxillofacial prosthesis used to close, cover or maintain the integrity of the oral and nasal compartments resulting from a congenital, acquired or developmental disease process, i.e., cancer, cleft palate, osteoradionecrosis of the palate. The prosthesis facilitates speech and deglutition by replacing those tissues lost due to the disease process and can, as a result, reduce

nasal regurgitation and hypernasal speech, improve articulation, deglutition and mastication. *An obturator prosthesis is classified as surgical, interim or definitive and reflects the intervention time period used in the maxillofacial rehabilitation of the patient.*

FUNCTIONS OF OBTURATOR

The obturator fulfills the following functions:

1. Feeding purpose.
2. Maintains the wound/defective area clean and hold dressings or packs post surgically in maxillary resections.
3. Enhances the healing of traumatic or post-surgical defects.
4. Helps to reshape/reconstruct the palatal contour and/ or soft palate.
5. Improves speech.

Surgical obturator

A temporary maxillofacial prosthesis inserted during or immediately following surgical or traumatic loss of a portion or all of one or both maxillary bones and contiguous alveolar structures (i.e. gingival tissue, teeth).

- ☐ The Surgical obturator is secured either by palatal screw, suture or circumzygomatic wires.
- ☐ Old denture can be used as a surgical obturator but it might create some problems because the denture mostly not fit as before surgery therefore relining may help to improve patient's acceptance and tolerance.
- ☐it is mostly used for 10 days more or less depends on treatment plane.

Advantages of surgical obturator:

1. Provides a matrix on which the surgical packing can be placed.
2. Reduces oral contamination of the wound and the incidence of local infection.
3. Enables the patient to speak more effectively by reproducing normal palatal contour and by covering the defect.
4. Permits deglutition, thus the nasogastric tube may be removed at an earlier date.
5. Lessens the psychological impact of surgery by making the post-operative course easier to tolerate.
6. Reduces the period of hospitalization.

Interim Obturator

The temporary obturator is constructed from post-surgical impression cast which has a false palate and false ridge and generally no teeth. Every step of prosthesis construction must maximize prosthesis adaptation to enhance retention and stability to ensure optimum function, esthetic, occlusion, and correct jaw relations.

- The closed bulb extending into the defect area is hollow.
- The patient is usually seen every 2weeks because of the rapid soft tissue changes that occur within the defect during organization and healing of the wound.
- Correction of tissue – prosthesis relation can be made by relining.
- The temporary obturator will need to function comfortably for as long as 6months.

• The timing depending on the size of the defect, the progress of the healing, presence, a absence of teeth.

Definitive obturator

A maxillofacial prosthesis that replace part or all of the maxilla and associated teeth lost due to surgery or trauma. It is made when it is deemed that further tissue changes or recurrence of tumor are unlikely and more permanent prosthetic rehabilitation can be achieved, it is intended for long term use.

Reasons for doing constructing new definitive obturator:

1. *The periodic addition of interim lining material increases the bulk and weight of the obturator and this temporary material may become rough and unhygienic.*
2. *If the anterior teeth are included in the resection, the addition of anterior denture teeth to the obturator can be of great psychological benefit to the patient.*
3. *If retention and stability are inadequate, occlusal contact on the defect side may result in improvement of these aspects.*

Feeding Prosthesis, feeding aids

- Maintain right and left maxillary segments of an infant cleft palate patient in their proper orientation until surgery is performed to repair the cleft.
- It closes the oral nasal cavity defect, thus enhancing sucking and swallowing,

Speech Aid Prostheses

A removable maxillofacial prosthesis used to restore acquired or congenital defect of the soft palate with a portion extending into the pharynx to separate the oropharynx and nasopharynx*during phonation and deglutition*, thereby completing the pharyngeal sphincter.

Such a prosthesis consists of:

- A palatal component, which contacts the teeth to provide stability and anchorage for retention; a palatal extension, which crosses the residual soft palate.
- And a pharyngeal component, which fills the palatopharyngeal port during muscular function, serving to restore the speech valve of the palatopharyngeal region.

Palatal lift prosthesis

A maxillofacial prosthesis which elevates the soft palate superiorly and aids in restoration of soft palate functions which may be lost due to an acquired, congenital or developmental defect.

Mandibular resection prosthesis:

Maxillofacial prosthesis used to maintain a functional positioning for the jaw, improve speech and deglutition following trauma or/and surgery to the mandible or/and adjacent structure.

Requirements of materials used for maxillofacial prosthesis are:

Physical and mechanical properties

1. High elongation strength
2. High tear strength
3. Softness, compatible to the tissue
4. High edge strength

5. Translucent.

Ideal processing properties:

1-chemically inert after processing

2-long working time

3-ease of intrinsic and extrinsic coloring with commercially available colorant.

4-no color changes after processing, retain intrinsic and extrinsic.

5-reusble mold.

Ideal biological properties

1-biocompatible

2-cleansable with disinfectant

3-resistance to the growth of microorganisms.

Prosthesis fixation

1. Anatomic (Teeth, Alveolar ridge, Residual hard palate, Residual soft palate, undercut)
2. Mechanical (clasps
3. Magnets
4. Adhesives
5. Implants
6. Screws.

Inorder to achieve favorable level of retention, remaining teeth,remaining hard and soft tissuemust be used to optimal degree. This may be gained by:

a. It is prudent to extend impression as much as possible without interfering with movable tissue.

b. Close adaptation to the underlying tissueresults in a thin fluid films between prosthesis and tissue.the thinner the intervening fluid,the greater the prosthetic retention

Classification of maxillofacial prosthesis according to the retention means are

1. Tissue retained maxillofacial prosthesis
2. Toothretainedmaxillofacial prosthesis
3. implant retained maxillofacial prosthesis
4. tissue/implant retained maxillofacial prosthesis

SUPPORT is the ability to resist displacement of the prosthesis toward the supporting structures. Remaining teeth, remaining edentulous areas and the postsurgical defects are the supporting tissues for prostheses and prosthesis loads are generated through these tissues to the underlying supporting bone.

STABILITY: It is the resistance to prosthesis displacement by **functional forces**.

Adhesives (They enhance retention through optimizing interfacial force by

Diagnosis & treatment planning

a.Complete physical investigation.

b.Dental history.

c.Chief complaint.

d.Laboratory investigation, x-ray and study cast.

N.B

1. Tied cooperation between oral surgeon and prosthodontic to be able to offer adequate treatment to the patient.

2. When the patient comes to clinic before any surgical manipulation. the prosthodontist carefully examine the case, read x-ray, gathering all knowledge about systemic condition.

3. Study cast reveals the view intra-orally defines the area to be removed with the oral surgeon planning.

4. The prosthesis that needed:
- Immediate prosthesis
- Interm prosthesis
- Delayed,definitive, permanent prosthesis

Primary impression:-

A gauze may be placed in the defect-undercut- area and the preliminary impression was made in stock tray using irreversible hydrocolloid as tissue were still in the healing phase. Be careful in certain cases alginate may be tear in the defect area during removal.

Silicone impression material can be used. In some cases 2 compatible impression materials can be used in modified technique. The impression must extend as possible in the defected areas.

The primary cast obtained was used to fabricate a custom tray for the definitive impression. Any undercuts may interfere with tray construction must be blocked.

Relief areas must be determined also.

Final impression

The definitive impression is made a properly extended and well-adjusted special tray was made; sectional trays or double trays technique can be used.

Proper border molding and proper extension of the flanges must be established.

Digital Impressions

Laser surface scanning was applied to acquire three-dimensional imaging data of the patient's facial defect. Transferred to a CAD/CAM interactive program (in computer system for image processing produced a model for fabrication of the facial prosthesis.

Jaw Relation stage

- Minimal block out should be made because excessive block out result in unstable record base….
- Improve esthetic by an attempt to compensate for the loss of facial support on the defect side.

• Occlusal plane and wax level is difficult in most cases due to the tissue scar and block out procedure.

 Transfer the jaw relation to the

• Semi adjustable articulator.

• Monoplane occlusion used for those patients.

 Try in stage

In this stage should verify:

• Centric jaw relation

• Vertical dimension.

• Esthetic.

 Delivery stage

• Use of pressure indicating paste to check for pressure areas.

• Remounting of prosthesis for occlusal adjustment.

• Give instruction to the patient to maintain good oral hygiene.

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DENTAL IMPLANT TREATMENT (PROSTHETIC PARTS)

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Osseointegration is a direct bone anchorage of an implant body, which can provide a foundation to support prosthesis. *Dr Per-Ingvar Branemark,* Sweden Professor developed the concept of osseointegration and coined the term. In his study, microcirculation,Prof. Branemark surgically inserted the titanium chamber into the tibia of a rabbit. The initial concept of Osseointegration stemmed from vital microscopic studies. Then studies that followed involved titanium implants placed into jaws of dogs.

Oral Implantology (Implant Dentistry):It is the science and discipline concerned with the diagnosis, design, insertion, restoration and/or management of alloplastic or autogenous oral structures to restore the loss of contour, comfort, function, esthetics, speech and/ or health of the partially or completely edentulous patient

Implant Prosthodontics: It is the branch of implant dentistry concerning the restorative phase following implant placement and the overall treatment plan component before the placement of dental implants.

It is the phase of prosthodontics concerning the replacement of missing teeth and/or associated structures by restorations that are attached to Dental Implants .

Implant:-Any object or material, such as an alloplastic substance or other tissue, which is partially or completely inserted or grafted into the body for therapeutic, diagnostic, prosthetic or experimental purposes .

Implant Prosthesis: Any prosthesis (fixed, removable or maxillofacial) that utilizes dental implants in part or whole for retention, support and stability.

Implant System: Dental implant components that are designed to mate together. An implant system can represent a specific concept, inventor, or patent.

It consists of the necessary parts and instruments to complete the implant body placement and abutment components.

Osseointegration: The apparent direct attachment or connection of osseous tissue to an inert, alloplastic material without intervening connective tissue

Direct bone anchorage to an implant body, which can provide a foundation to support prosthesis (Branemark, 1983).

A direct structural and functional connection between ordered living bone and the surface of a load carrying implant (Albrektsson et al., 1981).

Endosseous Implant/Endosteal Implant:

A device placed into the alveolar and/basal bone of the mandibleor maxilla and transacting only on cortical plate .

A device inserted into the jawbone (endosseous) tosupport a dental prosthesis. It is the 'tooth root' analogue and is often referred to as *fixture* (Richard Palmer).

Implant classification

Dental implant can be classified depending on placement within tissue

- *Subperiosteal:* A CoCr casting custom made for an edentulous bony ridge and placed subperiosteally with integral trans-mucosal posts for denture retention.
- Transmandibular (transosseous) dental implants "staple boneplates":

- The staple bone plate is used to rehabilitate the atrophic edentulous mandible.
- It is a transosteal threaded posts which penetrate the fullthickness of the mandible and pass into the oral cavity in the parasymphysial area

- *Submucosal implants:* A small "pressstud- like" device within the soft tissue helping to retain a denture, usually maxillary
- *Transdental fixation:* A metal implant placed through a tooth and extended through the root canal into the periapical bone to stabilize the mobileTooth sometimes referred to as endodontic implants This was first used by *Cuswell and Seniain* 1983

• *Endosseous—blade (plate), ramus frame, transosteal or staple, root form, or cylindrical:* Theseimplants are anchored in bone and penetratethe oral mucosa to provide prostheticanchorage.

1- Classification of endosseous implants according to their design:

a- Cylinders endosseous implants.
b- Screws or spiral post endosseous implants.
c- Blade form endosseous implants.
d- Root form endosseous implants

2- Classification of endosseous implants according to their material:

a- Pure titanium: the titanium oxide surface was responsible for the formation of the direct bone- implant interface.

b- Titanium alloy: the titanium alloys exist in three forms: alpha, beta and alpha beta phases and they all originate when pure titanium is heated and mixed with aluminium and vanadium.

3- Classification of endosseous implants according to surface characteristics:

a- Sand blasted surface.

b- Titanium Plasma Sprayed surface (TPS), it has satisfactory results regarding the osseointegration and the clinical prognosis.

***c- Titanium oxide surface*coating** the implants to make the inert metal a bioactive one.

d- Hydroxyapetite coating

4- Classification of endosseous implants according to the insertiontechnique:

The insertion techniques of endosseous implants have been classified into either:

a- Press fit technique, in this type of unthreaded implants, the implant site is drilled slightly smaller than the actual implant size, where the implant is pressed into the recipient site withslight friction.

b- Self tapping technique, in this type of threaded implants, the implant threads are used to tap its site during insertion.

c- Pre-tapping technique, in case of very dense bone, the implant sites are better to be previously tapped using the bone tap instrument before insertion of the threaded implant

5- Classification of endosseous implants according to surgical stages:

a- ***Single stage design (none submerged – transgingival):*** the body of the implant is inserted into the bone with its abutment portion penetrating through the mucoperiosteum during the healing period. Surgical placement of a dental implant, which is left, exposed to the oral cavity following insertion. This is the protocol used in non-submerged implant systems

b- Two stage design: in this design the implant body is completely embedded in bone for complete osseointegration. The implant body is then exposed and the healing abutment is placed for soft tissue healing before the impression is made for prosthesis fabrication

6.Classification of endosseous implants according to the time of installation:

a- Immediate implants, they are placed into a prepared extraction socket following tooth extraction.

b- Immediate delayed implants, they are placed within 6-12 weeks after the tooth loss.
c- Delayed implants, they are placed within 6-12 months after tooth extraction, when complete healing and bone remodeling occur

7.Classification of endosseous implants according to time of prosthetic loading:

a- Immediately loaded implants, an acrylic resin prosthesis which is designed to be out of occlusion is placed immediately after implant placement, specially in anterior region for esthetic purposes.
b- Delayed loading implant, delayed loading is done in maxillary implants after 4-6 months and in mandibular implants after 3-4 months to allow for better osseointegration due to the difference of the investing bone composition

Factors affecting healing

1- Surgical technique

All surgical procedures are traumatic. The level of trauma is a critical factor that determines whether healing will progress toward fibrous or osseous integration. Surgical preparation onhard tissue causes a necrotic zone of bone (interface) due to cutting of blood vessels, frictional heat, and vibrational trauma.
Excessive trauma leads to fibrous encapsulation of the implant.
Surgical trauma must be minimized during all aspects of implant surgery to optimize success rates. The temperature for impaired bone regeneration has shown to be as low as 44C□ to 47 C□ for one minute.

2- Premature loading

Time should be allowed for healing of necrotic bone,formed due to surgery. Movement of the implant during this healing phase will result in fibrous encapsulation. For this reason it is recommended by many operators to keep therecently placed implants unloaded for a period of two to eight months depending on the *clinical situation, implant coating, location of the implant, and whether the implant is placed into bone grafts.*

3- Surgical fit

Even with the best technical precautions, bone contactsonly portions of the implant and a perfect microscopic contact is not possible. A longer healing period will be required before loading implants then surgical fit less then optimal

4- Bone quality and quantity

The mandible has a denser cortex and a coarser thickercancelli than the maxilla. When we go posterior, jaws tend to have a thinner, more porous cortex, and a finer cancelli. Bone regeneration is more likely to progress at a faster rate if the surrounding is denser. it is very frequent to find that bone amount is not enough for implant placement.
The following measures can be done to overcome this problem:
- The use of shot implants.
- Changing the implant angulations.
- Ridge augmentation.
- Transpositioning of the neurovascular bundle in the mandible.
- Subantral augmentation (sinus lift) in the maxilla.
- Bone synthesis (ossified tissue can be created in predetermined shapes and dimensions).

5- Physical condition of the patient:

Nutritional status, aging, diabetes mellitus, blooddiseases, corticosteroids therapy and radiation treatment are among many factors which can affect healing.

Team approach

- ✓ Some authors believe that the same operator should placeand restore the implants. The rationale is that it is more efficientform a patient's point of view. It also allows the practitionermore freedom in changing the predetermined position of theimplants at the time of surgery. Because the same individual isresponsible for the prosthetic treatment, these changes can beincorporated into the treatment plan more readily.
- ✓ Others believe that a team approach is more appropriateto follow. A surgeon should place the implants, and a prostheticdentist should complete the restoration. Because it allows for theutilization of expertise of the two individuals, there is a built- insecond opinionin the approach. Additionally, there is shared responsibility andshared liability. Regardless of the philosophy followed, it is wellto delineate the responsibilities at each stage of implant therapy,and it should be clear that dental implant is *a prosthetic technique with a surgical step.*

The prosthodontic should:

1- Perform the initial clinical evaluation.
2- Perform the initial radiographic evaluation.
3- Obtain the diagnostic casts.
4- Obtain the diagnostic wax- up.
5- Determine the location and number of implants and fabricate a surgical template.
6- Select the proper abutment following the implant exposure.
7- Design and fabricate the prosthesis.
8- Provide oral hygiene care and instructions.
9- Ensure recall of the patient to evaluate maintenance and provide care as required.

The oral surgeon responsibilities include:

1- Confirmation of the radiographic evaluation.
2- Confirmation of the physical evaluation.
3- Determination of the location and number of implants within limits set by the prosthetic dentist.
4- Placement of the implants (first stage surgery).
5- Uncovering of the implants (second stage surgery).
6- Confirmation of osseo-integration of the implants.

COMPONENTS OF BRANEMARK IMPLANT SYSTEM as in figure -

I. Implant Fixture/Implant Body

The portion of a dental implant that provides support for the abutment(s) through adaptation upon (eposteal), within (endosteal) or through (transosteal) the bone . The body is that portion of the implant designed to be surgically placed into the bone. It may extend slightly above the crest of the ridge.

II. Healing/Cover Screw

The component of an endosteal dental implant system used to seal, usually on an interim basis, the dental implant body during the healing phase after surgical placement. The purpose of the healing screw is to maintain patency of the internal threaded section for subsequent attachment of the abutment during the second stage surgery .

III. Healing Abutment/Interim Endosteal Dental Implant Abutment

Any dental implant abutment used for a limited time to assist in healing or modification of the adjacent tissues .

After a prescribed healing period that allows a supporting interface to develop, second stage surgery is performed to uncover or expose the implant and attach the transepithelial portion or abutment. This transepithelialportion is termed a second stage permucosalextension, because it extends the implant above the soft tissue and results in the development of a permucosalseal around the implant.

IV. Implant Abutment

The portion of a dental implant that serves to support and/or retain any prosthesis .

Three main categories of implant abutments are described according to the method by which theprosthesis or superstructure is retained to the abutment:

(i) an abutment for screw uses a screw to retain the prosthesis or superstructure;

(ii) an abutment for cementuses dental cement to retain the prosthesis orsuperstructure;

(iii) an abutment for attachment uses anattachment device to retain the removable prosthesis.

Many manufacturers classify abutments as fixed whenever cement retains the prosthesis and removablewhen they are screw retained. Each of the three typesof abutments is further classified into straight and angled abutments, describing the axial relationship between the implant body and abutment.

V. Hygiene Screw

It is placed over the abutment between prosthetic appointments to prevent debris and calculus from entering the internally threaded portion of the implant.

VI. Transfer Coping/Impression Coping

Any device that registers the position of the dental implant body or dental implant abutment relative to adjacent structures.

VII. Implant Analog

An analog is something that is analogous or similar to something else. Implant analog is used in the fabrication of the master cast to replicate the retentive portion of the implant body or abutment. After the master impression is secured the corresponding analog (implant body, abutment for screw or other portion) is attached to the transfer coping and the assembly is poured in stone to fabricate the master cast.

VIII. Coping/Gold Cylinder

It is a thin covering usually designed to fit the implant abutment and serve as the connection between the abutment and the prosthesis or superstructure. A prefabricated coping usually is a plastic pattern cast into the metal superstructure or prosthesis.

IX. Coping Screw

The screw retained prosthesis or superstructure is securedto the implant body or abutment with a coping screw.

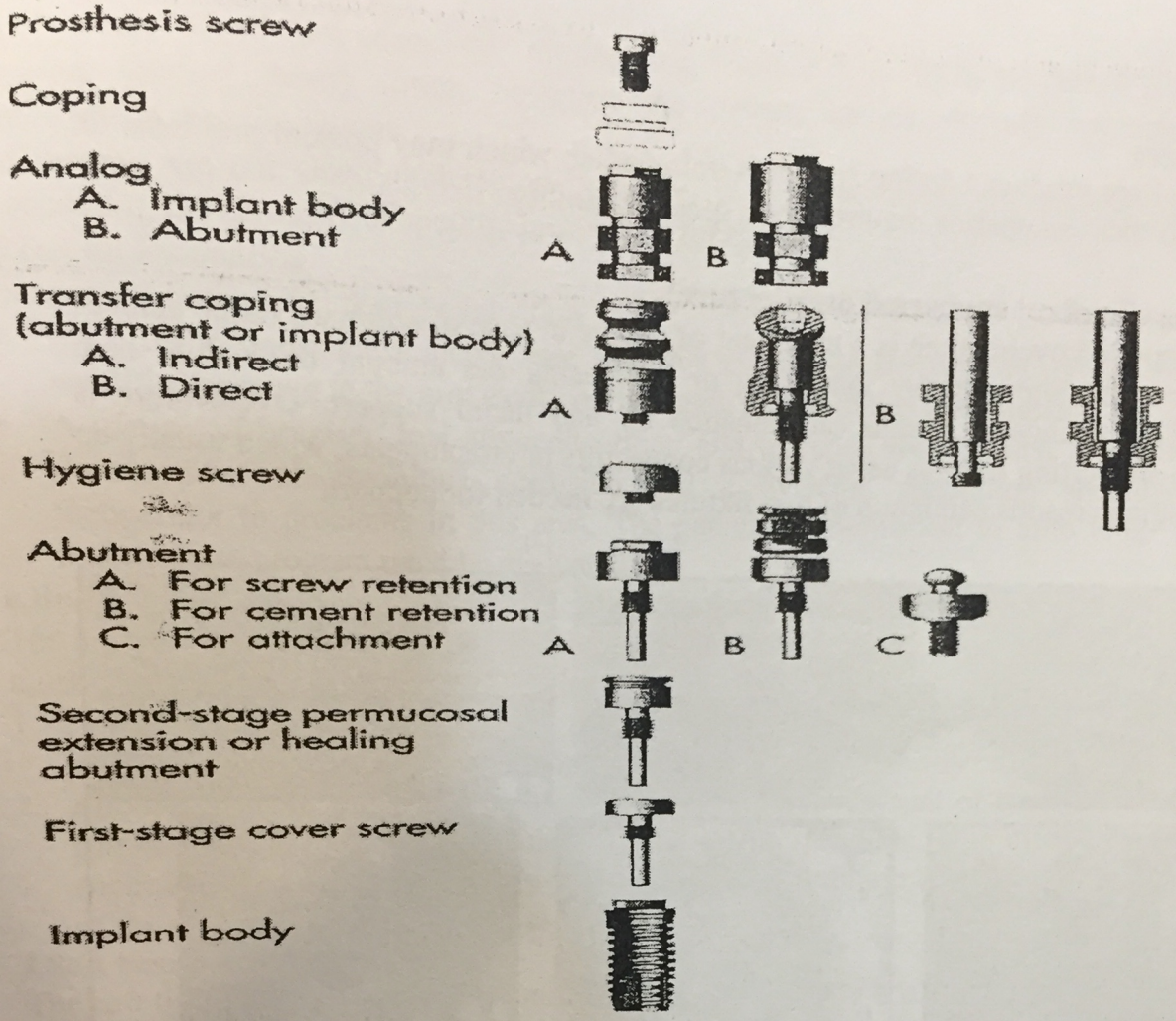


Figure -1 component of Branemark implant system

PROSTHETIC OPTIONS IN IMPLANT DENTISTRY

A. Implant supported single tooth
B. Implant supported fixed bridge or partial denture
C. Fully Bone Anchored Prosthesis, Implant supported full arch prosthesis screw retained
D. implant supported over denture

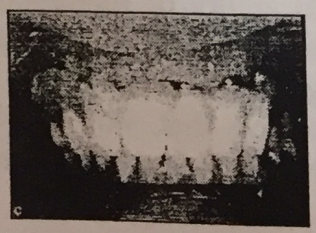
Fully Bone Anchored Prosthesis fig -2

The fully bone anchored prosthesis is connected to supporting fixtures through the transmucosal components, the abutments either in the maxilla/mandible. To provide proper support for a fully bone anchored prosthesis a minimum of four to six fixtures are necessary.

Ideally a fifteen millimeter length/longer should be placed when there is adequate bone. If bone density and quality is poor, the number of fixtures should be increased.

Design

Fully bone anchored prosthesis does not obturate the space between the prosthesis and residual tissues.



Advantages

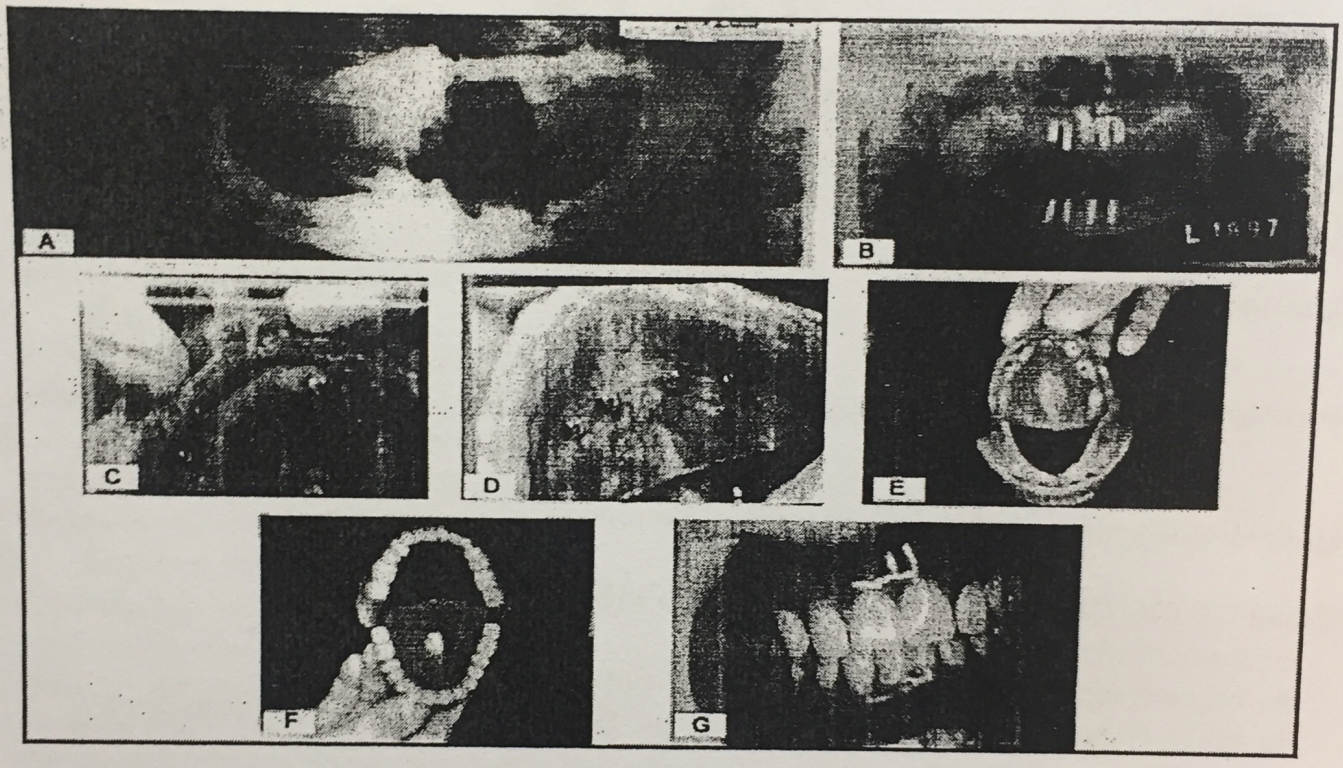
- Satisfies functional demands.
- Greater psychological acceptance.

Disadvantages

• Airflow pattern produced during speech is unimpeded, which may present problems for the patient if their occupation requires good speaking ability.

Overdenture(implant supported overdenture)

Implant supported overdenture is a treatment of choice in case of soft/hard tissue defects, Esthetics can be improved by increasing or decreasing the amount of denture base material. This change in design can enhance lip and facial support. Overdenture is attached to supporting fixtures using various connectors or attachments, which usually do not alter esthetic results.Minimum of two fixtures are needed for support.



BASIC SEQUENCE OF PROCEDURES IN IMPLANTS TREATMENT

a.Chief Complaint:

The practitioner must determine which is the most important for the patients, aesthetic, mastication or phonation.This requires careful listening and sufficient time

b.Physical Evaluation:

The medical history normally taken in the modern dental office often is enough for implant patient. It must be kept in mind that there are few contraindications to the use of dental implants. Proper evaluation should be made whether the patient can tolerate the planned procedures or not consultation with the surgeon at this point may be necessary to arrive at proper evaluation in- patients with complicated medical history.

The physical ability or limitations of the patient also play a part in the design of the prosthesis, the selection of the final restoration.

c.Psychological Evaluation

One must realize that. For many patients, the perception of what constitutes implant therapy has been formed from information provided by friends, publications, and other

mass media. This is not necessarily all negative, because it results in the patient seeking implant therapy. Many times, however, the patient cannot properly evaluate the information, and limitations
of therapy are not clearlyunderstood therefore, it is necessary to educate the patient concerning the necessity of specific procedures for the case.

d.Dental Evaluation

In addition to the usual dental evaluation,

- the prosthodontist must incorporate into this evaluation the possible effects of the conditions present in the oral cavity on implants placed in this environment.
- A history of bruxism, mal-aligneddentition and extruded teeth, which preclude the development ofharmonious occlusion and a hygienic restoration should alert theoperator to problems in this area. The patient's commitment to alife long- term maintenance program must be evaluated.

e.Bone

The age of the patient and the amount and type of bone available to support the implants must be determined through the following:

1. radiographs evaluation,The types of radiographs used depend on the number of implants to be placed, the location in the jaws, and the availability of theequipment.
2. Another method, which can be used in determiningthe amount of bone available, is palpation. This method isparticularly useful in the mandible. It is often possible to encircle the mandible completely with forefinger and thumb andobtain an indication of the size and shape of the arch at aparticular point.

f.Soft tissue

The soft tissue through which implants exist in the oral cavity is a critical area in terms of long- term success. This is the area that the patient must maintain to ensure gingival health and therefore must be capable of withstanding the hygiene manipulation (brushing and flossing). Fixed keratinized tissue is the preferred tissue in this area. This is the only type of tissuethat has ability to form a tight collar around the implant necks. If soft tissue grafting is anticipated, it is probably best done before implant placement.

h.Ridge relationships

The relationship of the maxilla to the mandible plays an important role in determining the type of prosthesis that can be done and is a deciding factor in the type of occlusion that can often be determined by visual examination, the best observation of this relationship is achieved from mounted diagnostic casts.

i.Radiographic evaluation

radiological evaluation for determination of sufficient bone quantity and quality to support the implants must be done. The choice of radiological technique appropriate for a given patient depends on a number of factors, including the *type of restoration and implants to be used, the position of the remaining dentition, the extent to which bone quality or quantity is in question, the availability of the machine needed, and the coast.*
The following radiological techniques areavailable:

1- Periapical radiographs.
2- Panoramic radiographs.
3- Lateral cephalometric radiographs
4- Conventional tomograms (CT).
5- Computed tomography.

6- Magnetic resonance imaging(MRI)

A maker of known size should be placed directly on the mucosa during the exposure, when a periapical or panoramic radiographs was selected as the preferable technique. The aim of placing such marker (metal ball of known diameter) is the determination of actual ridge height because ordinary radiographs do not have one- to one correspondence with regard to size. For example, if the actual diameter of the maker is 5 mm. However, on the panoramic film they measure 6 mm., a 20% magnification occurred. Therefore, if the bone measure above the interior dental canal is measured 22 mm on the film only 18.3 mm is actually available.

A.RadiographicStent

A diagnostic template incorporating stainless steel balls is used for treatment planning of the implant position. The actual diameter and position of the stainless steel balls in the template relative to the diameter and the position measured on the radiograph help determine distortion of size and position as seen on the radiographs.

In the maxilla the vertical bonebetween the floor of maxillary sinus-alveolar crest and nasal floor-alveolar crest is evaluated. In mandible distance from inferior dental canal or mental foramen is evaluated.

Surgical Template As mentioned in radiographic splint, surgical template can be fabricated by duplicating the existing denture or a newly fabricated prosthesis. Once the position of the implants is determined by palpation clinical, radiographic and diagnostic cast examination, the surgical stent is fabricated.

There are two main functions for the stent,

1) guide the operator to the selected places for implant placement
2) to direct the operator drill to a proper direction through which he should drill in bone

The surgical stent can be fabricated using a clear heatcured or autopolymerized acrylic resin and of approximately 4mm in thickness..

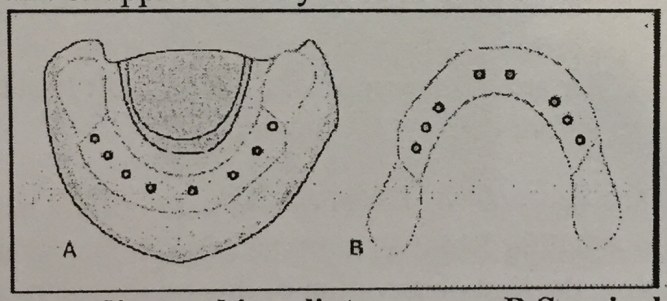
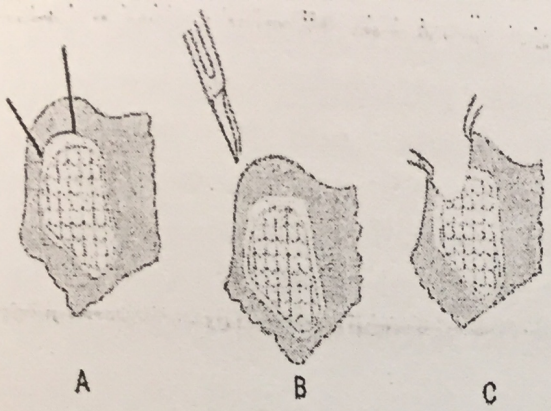


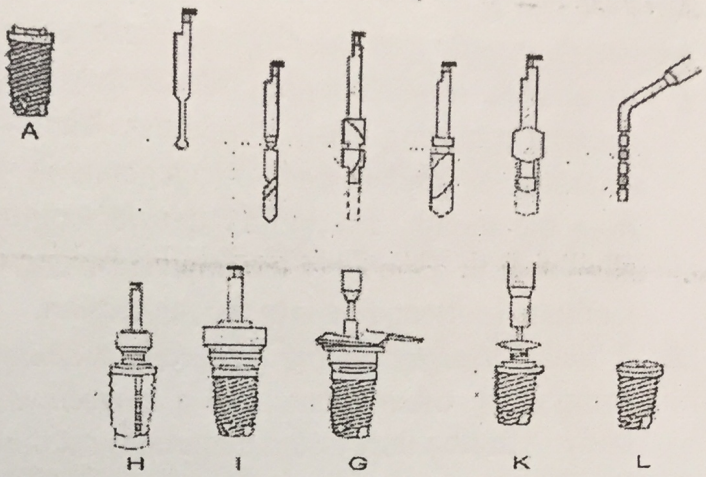
Fig 2: A.radiographic splint B.Surgical stent

First Stage Surgery The following case demonstrates the placement of Branemark implant

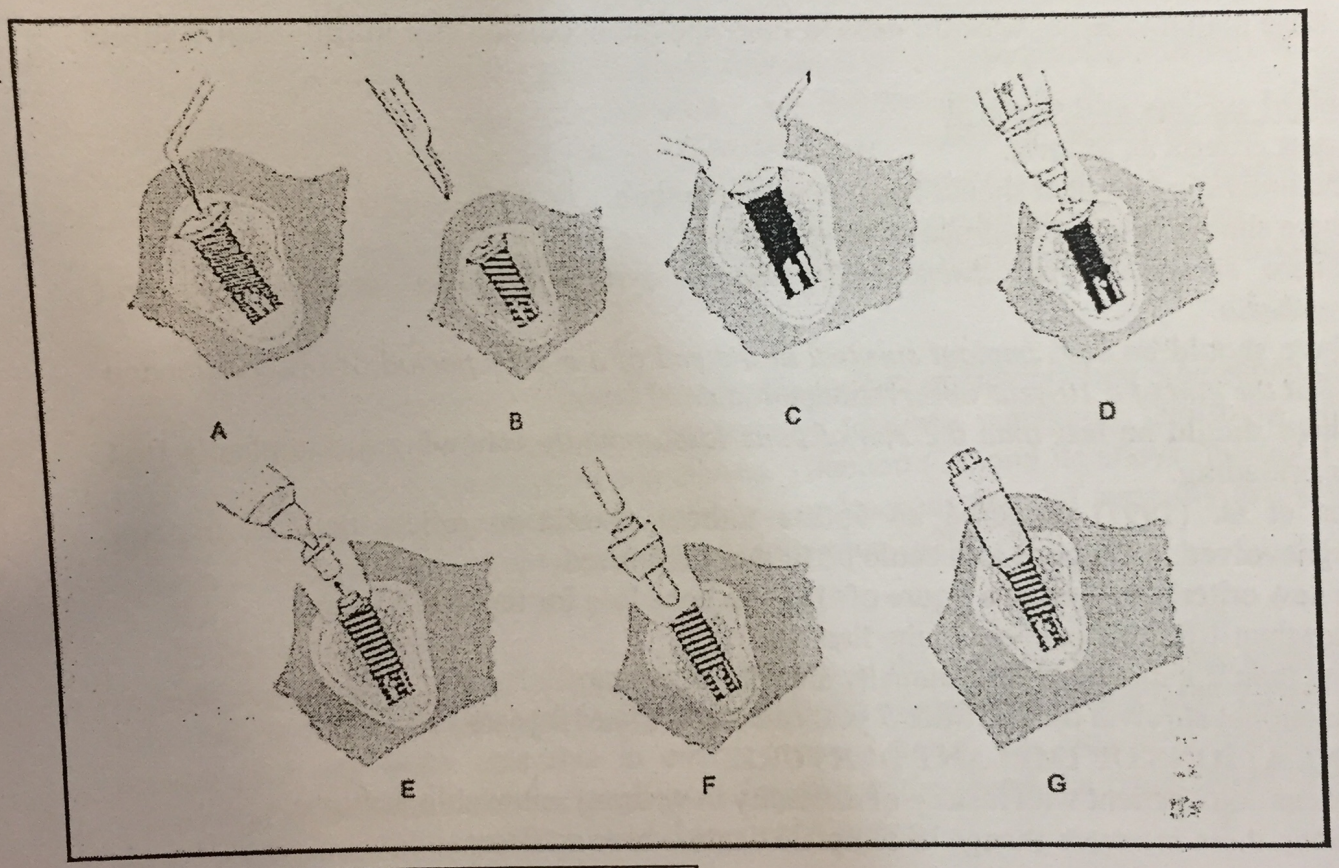
Second Stage Surgery The uncovering of the implant is carried out after a healing phase of at least 4 months. The gingival former is screwed onto the implant and the flap sutured Around



The bone is exposed by an incision and reflection of mucosal membrane and periosteum (full thickness flap



Procedure for implant placement



Second stage surgery

D.Imression

After complete healing of gum about 2weeks ,next step impression making.

Occlusion rims are used to establish maxilla mandibular relations followed by trial of the waxed up then denture and final denture insertion.

Classification of impression techniques according to the level of impression into:-

a. Implant level impression techniques(open and closed impression techniques)
b. Abutment level impression techniques

Two basic techniques are used to make a master impression, and each use a different transfer coping based on the transfer technique performed in the mouth or on a master cast (implant level).

1. An *indirect transfer coping (closed tray impression techniques)* utilizes animpression material requiring elastic properties. Theindirect transfer coping is screwed into the abutment or implant body and remains in place when the setimpression is removed from the mouth. The indirecttransfer coping is parallel sided or slightly tapered to allowease in removal of the impression and often has flat sidesor smooth undercuts to facilitate reorientation into the impression.
2. A *direct transfer coping (open tray techniques)* usually consists of ahollow transfer component, often square and a longscrew to secure it to the abutment or implant body. Afterthe impression material is set the direct transfer copingscrew is unthreaded to allow removal of the impressionfrom the mouth.
   The direct transfer coping takesadvantage of impression materials having rigid propertiesor eliminates the error of permanent deformationbecause it remains within the impression on its removal.

E. Base plate/modeling wax are used to fabricate the occlusion rim in the usual fashion.
Wax

Implant success and survival

success criteria as follows:

- The individual implant should be *clinically immobile*.
- There should be *no radiographic radiolucency*.
- There should be an *absence of persistent pain, infections, neuropathies, and paresthesia*.
- There should be *85% implant survival at the end of a 5-year period* of observationand *80% at the end of a 10-year* observationperiod.
- There should be *less than 0.2 mm of bone loss annually* following the implant's first year ofloading.

Roos et al. (1997) proposed an update tothese criteria to reflect that, as implant designevolved, early bone loss could be further minimized.
The new criteria suggested a figure of<1.8 mm bone loss for the first 5 years.

- Less than 1.0 mm bone loss in the first year
- Less than 0.2 mm bone loss annually after the first year
- Functional survival of 90% after 5 years and 85% after 10 years

INDICATIONS OF IMPLANT DENTURE

1. Edentulous patient with history of difficulty in wearing removable dentures.
2. When there is severe change in complete denture bearing tissues.
3. Poor oral muscular coordination.
4. Para-functional habits that compromise prosthesis stability.
5. Unrealistic patient expectations for complete dentures.
6. Hyperactive gag reflex.
7. Low tissue tolerance of supporting mucosa.

CONTRADICTIONS OF IMPLANT DENTURE

1. High dose irradiated patients.
2. Patient with psychiatric problems such as psychosis, dysthorphobia.
3. Hematological systemic disorders.
4. Pathology of hard and soft tissues.

5. Patient with drug, alcohol or tobacco chewing abuse.

CHARACTERISTICS OF THE OSSEOINTEGRATED IMPLANT

- The most important characteristic of this osseointegrated implant is that the direct bone anchorage can support a freestanding fixed prosthesis.
- Occlusal forces generated by patients with fully boneanchored prosthesis are said to approximate the forces recorded in patients with natural dentitions.
- The patient with fully bone-anchored prosthesis has masticatory functions similar to natural dentition.
- This kind of implant can be retrieved in case of failure and another fixture placed at a later time.

BASIC GUIDING FACTORS OF OSSEOINTEGRATION

1. Biocompatibility of Implant Material

Materials used for fabrication of dental implants can be categorized in two different ways. From a fundamental chemical point of view, dental implants fall into one of the following three primary groups: *(a) Metal (b) Ceramics (c) Polymers.*

In addition biomaterials can be classifiedbased on the type of biologic response they elicit whenimplanted and the long-term interaction that developswith the host tissue. Three major types of biodynamicactivity are *(a) Biotolerant (b) Bioinert (c) Bioactive*. The different levels of biocompatibility emphasize the fact that no material is completely accepted by the biologic environment. To optimize biologic performance, artificial structures should be selected to minimize the negative biologic response while ensuring adequate function.

Metals for implants have been selected based on a number of factors: their biomechanical properties, previous experience with processing, treating, machining, finishing and suitability for common sterilization procedures. Titanium (Ti) and its alloys (mainly Ti-6Al- 4V) have become the metals of choice for endosseous parts of currently available implants. Implants made of *commercially pure titaniumCpTi*

2. Implant Design

Implant design refers to the 3-dimensional structure of the implant, with all the elements and characteristics that compose it. Endosseousdental implants exist in a wide variety of designs with the main objective in every instance being the long-term success of osseointegratedinterface and uncomplicated function of the prosthetic replacement. It has great influence on initial stability and subsequent function.

The main design parametersare:

- *Implant Length*

Implants are generally available in lengths from about 6mm to as much as 20 mm. The most common lengthsemployed are between 8 and 15 mm, which correspondquite closely to normal root length.

- *Implant Diameter*

A minimum diameter of 3.25 mm is required to ensureadequate implant strength. Implant diameter is moreimportant than implant length in the distribution of loadto the surrounding bone.

- *Implant Shape*

Hollow cylinders, solid cylinders, hollow screws or solidscrews are commonly employed shapes, which aredesigned to maximize the potential area for osseointegrationand provide good initial stability. Screw shapedimplants also offer good load distribution characteristicsin function.

Dental implants are also categorized into

- ✓ *Threaded screw implants* are threaded into a bone site and have obvious macroscopic retentive elements for initial bone fixation. The fixture with threaded surface has :-
  a. Larger surface area and the threads also help to balance the force distribution into the surrounding bone tissue.
  b. The threads created in the bone site play an important role in initialimplant fixation.
- ✓ *non-threaded, cylindrical or press fit.* The press fit implants depend on microscopic retention and or bonding to the bone, and usually are pushed or tapped into a prepared bone site

Precision fit of the fixture called primary stability is an essential element for osseointegration, the failure of which leads to soft tissue proliferation between the fixture and bone rather than direct bone interface

- ➢ *Surface Characteristics*

The quality of the implant surface influences wound healing at the implantation site and subsequently effect osseointegration.

Smooth surface: Wennerberg and Coworkers suggested that smooth be used to describe abutments, whereas the terms minimally rough (0.5 to 1 μm), intermediately rough (1 to 2 μm) and rough (2 to 3 μm) be used for implant surfaces.

Rough surface: Plasma spray coating is one of the most common methods for surface modification.

- ***Plasmaspraying***
- ***blasting with particles***. Inthis approach, the implant surface is bombarded withparticles of aluminium oxide (Al_2O_3) or titanium oxide(TiO_2) and by abrasion; a rough surface is producedwith irregular pits and depressions. Roughness dependson particle size, time of blasting, pressure and distancefrom the source of particles to the implant surface.
- ***Chemical etching***is another process by which surfaceroughness can be increased. The metallic implant isimmersed into an acidic solution, which erodes its surface,creating pits of specific dimensions and shape.

Concentration of the acidic solution, time and temperature are factors determining the result of chemical attack and microstructure of the surface.

- ***Porous:*** Porous sintered surfaces are produced whenspherical powders of metallic or ceramic material becomea coherent mass with the metallic core of the implantbody. Lack of sharp edges is what distinguishes thesefrom rough surfaces.

  Porous surfaces are characterizedby *pore size, pore shape, pore volume and pore depth,* which is affected by the size of spherical particles, temperature and pressure conditions of the sinteringchamber.
- ***Prosthetic Interface***It is the *level at which the superstructure or the abutment connects to the implant body.* It can be either
  - *external.* The most common external connection isthe *hexagonal ("hex") type.* The 0.7 mm high, 2.7 mmwide, straight external hex on a 4.1 mm diameterplatform is

considered the industry's standard. Due to its strength and stability limitations, however, variations in the hex and platform have evolved. The standard external hex allows 4.0° to 6.7° of rotational wobble with 3°-5° of tipping depending on the type of hex. Fullseating of abutment over fixture can only be verified bytaking additional radiographs. Without intimate contactbetween the walls of the mating hexes, cyclic loading transmits forces directly to the fixation screw, which may cause it to repeatedly loosen.

- An *internal hex* in the implant is designed to prevent rotation of the abutments. Compared to an external hex, an internal hex allows a better protection against rotation of abutments and against gap formation at the implantabutment interface.
- *External spline* by Calcitek acknowledges that its 0.4 mm spline connection allows 3° tipping thereby transferring forces to the abutment screw under lateral loading. However the butt joint shoulder of the splineconnection can also trap soft tissue during abutmentseating. Furthermore the 1.0 mm height of the spline connection can interfere with occlusal clearance and hinder establishment of anatomical contours on angled abutments.
- *Non-hexed conical connection* is an ITI implant design which has a conical opening to an internally threaded shaft. Tightening an abutment with a matching conical surface provides lateral stability. It provides no interdigitation to resist rotation, which is of somesignificance in single tooth restorations. In order to assure contact with the mating conical surface, the abutment cannot be designed to seat on the top surface or'shoulder' of the implant. This limitation prevents the use of abutments wider than the diameter of the conical opening and leaves the shoulder exposed to support the restoration. Without flush fitting abutments, there is no opportunity to prepare the margins to follow the natural contour of the tissue.
  - *Non-hexed morse*taper connection .

a. A 1°-2° tapered abutment post frictionally fits into the non-threaded shaft of the implant, which has a matching taper.
b. The body of implant is designed with a series of fins for a press fit insertion procedure.
c. The connection also dictates how abutments are attached and stabilized and the type of emergence profile they can provide. However there are several potential esthetic and hygienic limitations with this connection

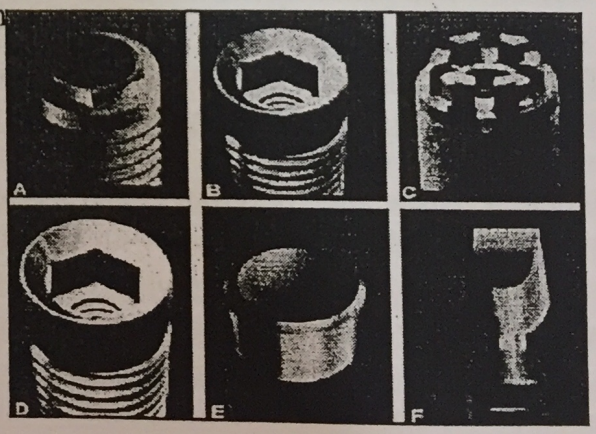


Fig 2 (A) Standard externalhex
(B) Internal hex
(C) External spline
(D) hexed conicalconnection
(E) Non-hexed morse taper repeated as easily as tightening a screw with a torque wrench, and will not work if the abutment hits the bone crest before the taper interlocks.

- **Bone Factor**

The stability of the implant at the time of placement is very important and is dependent upon bone quantity, quality as well as implants design.Bone, which is predominantly cortical, may offer good initial stability at implant placement but is more easily damaged

by overheating during the drilling process, especially with sites more than 10 mm in depth. Success is highly dependent upon a surgical technique, which avoids heating the bone. Bone should not be heated beyond 43°C, since alkaline phosphate begins to breakdown.

Gentle surgical technique with the speed of drilling equipment not to exceed 2000 rpm and copious amount of sterile irrigation with internally irrigated drills should be used.

Factors that compromise bone quality are infection, irradiation and heavy smoking. Their effects results in diminution of the vascular supply to the bone which compromises healing response, a feature that has been well described in the healing of fractures.

- **Loading Conditions**

Following installation of an implant it is important that it is not loaded during the early healing phase. Movement of the implant within the bone at this stage results in fibrous tissue encapsulation rather than osseointegration.

This has been compared to the healing of a fracture where stabilization prevents non-union. The Branemarksystem emphasizes on maintaining the fixtures unloaded for six months in the maxilla and three to four months in the mandible, mainly because of differences in bonequality.

No loading while healing is the basic guide to osseointegration.

The surgical procedures are divided into two stages.

1) The first stage is the installation of the fixtures into bone, allowing a 3 to 6 month healing period. The mucosa supported interim denture should not be worn for 1 to 2 weeks, which also helps to prevent breakdown of the soft tissue wound. Bone healing begins within first week after insertion of the fixture and reaches a peak at the third or fourth weeks. The initial healing tissues gradually become bony tissue after six to eight weeks. If fixturesare displaced or loaded during this interim healing period, fibrous tissue formation will occur.
2) The second stage isthe connection of abutments to fixture.the two stage surgical procedures are very important for successful osseointegration.Following the recommended healing period (3-6 months) abutments are connected to theimplant to allow construction of prosthesis.

Occlusion in implant-supported prostheses

There are a few innate differences between natural teeth and implants, which need to be considered when restoring implants.

Natural teeth are associated with high occlusal awareness (proprioception) of about 20 µmbesides the proprioception, the presence of periodontal ligament as a shock absorber in a natural tooth brings about an apical intrusion.

Occlusal no proprioception in implants. The lack of proprioception and the absence of periodontal shock absorption are often associated with increased impact force with an implant-supported prosthesis than with a tooth-supported prosthesis

In case of occlusal trauma, mobility can develop in a tooth as well as in an implant. However, upon removal of the trauma, mobility can be reduced or controlled with a natural tooth, while no such response can be noted in an implant.

In general the diameter of natural teeth is larger than the diameter of implants.

Also, the cross-section of implants is rounded and the diameter is selected primarily according to bone available, not according to the load that it is anticipated to be subjected to.

The issue of such differences between natural teeth and implants lead to the establishment of implant-protected occlusion (IPO It is also called medially positioned lingulalized occlusion, and it stems from the change in relation of the edentulous maxillary ridge to the mandibular ridge due to resorption of edentulous ridges in a medial direction. As a result, a few unique concepts are associated with implant-supported prosthesis and these constitute the guidelines for IPO

Occlusal form and scheme

-Where a single implant is to be restored, or a small implant bridge provided, the occlusal scheme should be confirmative. Group function is to be preferred to canine guidance,

-Where a full arch construction is utilized then 'balanced articulation' should be provided in order to minimize local loading and maximize stability of the prosthesis.

There is some evidence that a degree of horizontal freedom of movement is helpful, shallow cusp angles may beassociated with reduced horizontal loading of an implantduring mastication.

It is the relationship of the mandible to the maxilla in a horizontal plane. It can also be described as the relationship of the mandible to the maxilla in the anteroposterior direction. Horizontal jaw relation can be of two types namely centric and eccentric jaw relations.
Centric relation denotes the relationship of the mandible to the maxilla when the mandible is at its posterior most position. Eccentric relation denotes the relationship of the mandible to the maxilla when the mandible is at any position other than the centric relation position.

Centric Relation (definition)
The glossary of prosthodontic terms (GPT) enumerates seven different definitions for centric relation. **(most accepted definition)is:**
"The maxillomandibular relationship in which the condyles articulate with the thinnest avascular portion of their respective discs with the complex in the anterior-superior position against the slopes of the articular eminences. This position is independent of tooth contact. This position is clinically discernible when the mandible is directed superior and anteriorly. It is restricted to a purely rotary movement about the transverse horizontal axis" (GPT-5).
GPT-5 definition is commonly used and accepted. Generally speaking, centric relation can be described as the most posterior relation of mandible to the maxilla at the established vertical dimension from which lateral movements could be made. Any position of the mandible other than that of the centric relation is called an eccentric position.
Note: Centric relation is the most posterior relation of the mandible to the maxilla and the anterosuperior relation of condyle to the glenoid fossa.

The importance of recording centric relation in CD
1-Acceptable reference position for CD.
2- relatively repeatable (position which a patient is able to repeat).
3- recordable
4-The patient can find stable occlusal contact easily.
5-CR considered the starting point and the end point in any mandibular movement. for e.g. when person want to do functional movement like chewing, he start from centric occlusion which coinside with centric relation, then he moves his lower jaw laterally or forward and when swallow, the teeth meet into centric occlusion.
It is the dentist responsibility to record CR and the technician's responsibility to maintain this relation through carful laboratory

procedures. If CR is not recorded properly, the CD will not occlude or function correctly in the mouth.

Factors that affect Centric Relation records:

1- The resiliency of the supporting tissues.
2- The stability of the recording bases.
3- The TMJ and associated neuromuscular mechanisms.
4- The character of the pressure applied in making the recording.
5- The technique used in making the recording and the associated recording devices used.
6- The skill of the dentist.
7- The health and cooperation of the patient
8- The maxillomandibular relationship.
9- Character and size of the residual alveolar arch.
10- The size and position of the tongue.

Difficulties recording jaw relation

- ❑ Stability of bases
- ❑ Jaw tremor
- ❑ Recording constant rest position
- ❑ Sealing rims

Recording centric relation position

The most important maxillomandibular relation is that of centric relation (CR). An accurate CR record is absolutely essential to satisfactory CD fabrication. A tentative CR record is made on this third clinical visit with the record bases and occlusion rims. A new record is made at the try-in appointment.

The three primary requirements for making centric relation record are:-

1- To record the correct horizontal relation of the mandible to the maxillae.

2- To stabilize the lower record base with equalized vertical pressure.

3- To retain the record bases in an undistorted condition until the casts have been accurately mounted on the articulator.

Materials used to record jaw relationships should be easy to handle, uniformly soft while the record is being made, rapid setting, and totally rigid but not brittle when set. Materials usually used are:-

1- rapid setting plaster.

2- zinc oxide eugenol pasts.

3 - waxes.

4- modeling plastic (coumpund)

Number of methods to assist patient in retruding the mandible:-

1- Instruct the patient, to relax his jaw, pull it back, and close slowly and easily on his back teeth.

2- Instruct the patient by saying, get the feeling of pushing your upper jaw and closing back teeth together.

3- Instruct the patient to protrude and retrude the mandible repeatedly while you holds by your fingers lightly against his chin.

4- Instruct the patient to turn his tongue backward toward the posterior border of the upper denture.

5- Tilt the patient head back while the various exercises just listed are carried out.

6- Palpate the temporal and masseter muscles to relax them.

The effective way to retrued the mandible by instruct the patient to relax his jaw, pull it back and close slowly and easily on your back teeth, by this way we obtained good results. Then subsequent clinical checking and rechecking must be done throughout the denture construction.

Methods of recording the centric jaw relation:

The various methods to record centric relation are:

Physiological methods:

- Tactile or inter-occlusal check record method
- Pressureless method.
- Pressure method.

Functional method:

- Needleshouse method
- Patterson method

Graphic methods:

- Intraoral
- Extraoral

Radiographic method:

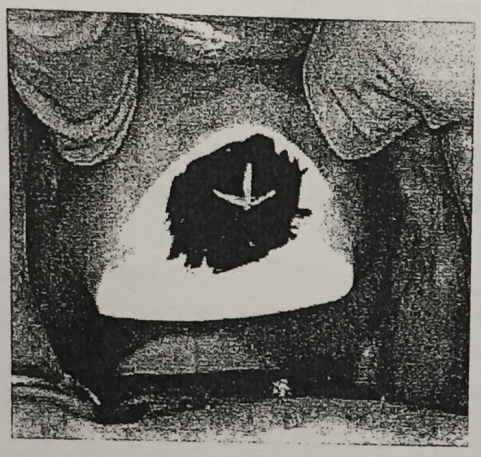
<u>Techniques</u>

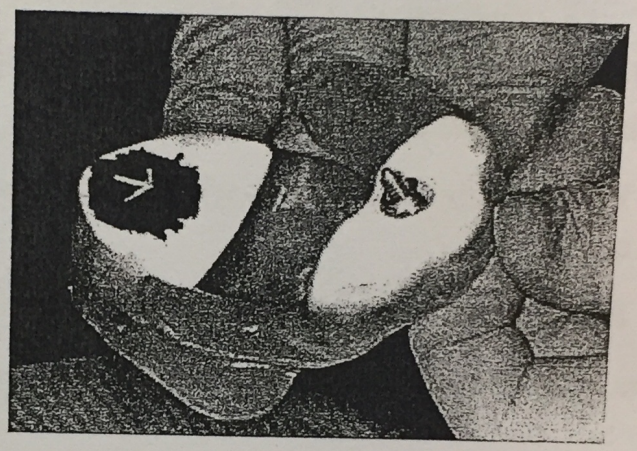
1- ***Functional technique***

Or called chew-in, examples on this are Patterson and Needle- house techniques. The patient produces a pattern of mandibular movements by moving the mandible to protrusion, retrusion and right and left lateral movement.by using compound or wax occlusal rims.

2- ***Graphic technique***:-

Record a tracing of mandibular movements in one plane, an arrow point tracing and central bearing device are examples.it indicates the horizontal relation of the mandible to maxillae. The apex of a properly made tracing indicates the most retruded position of the mandible. It was either intra or extra oral devise.





Apex of arrow depicts centric record arrow *view of pin and recorded*

3-Interocclusal check record (Tactile)

Tactile sense method is essential in making an accurate record

The visual acuity and the sense of touch of the dentist also inter in making of centric relation record, this phase is developed with experience and is difficult to teach to anther individual. Technique for the tactile method :- divided into two steps

1- Tentative record using occlusion rims attached to accurate stable record bases.

2- Interocclusal check records with the teeth arranged for try-in.

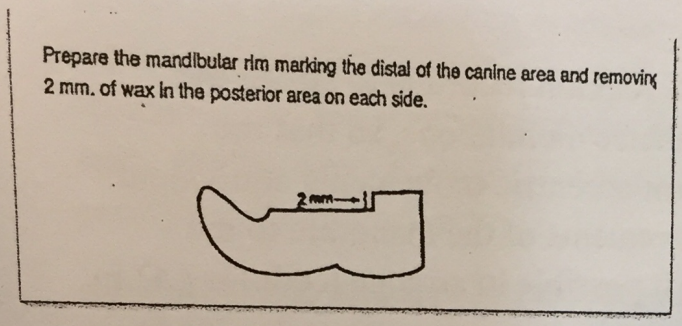
The steps which to be followed for tentative record start after establishing the VD of the jaws, and mounting of the face-bow transfer:-

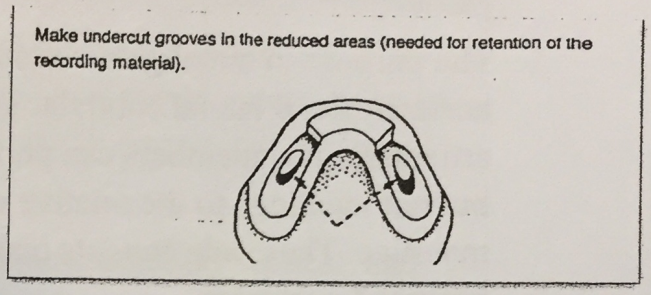
1- Seat the patient comfortably with head upright.

2- Make Two sharp "V"-shaped notches in the molar/premolar area of each sided wax

Depth 3-4 mm

3- Reduce the mandibular occlusal rim from the premolar area to the end to allow for the excess interocclusal distance.





4-making role of soft wax, Place wax into a 1-2mm slot in mandibular rim. Ensure wax is soft.

5-Stabilize mandibular record base using index fingers on the flange and the thumbs under the symphysis.

6-make a tentative centric record by having the patient retrude and close the jaw until he feels the closure to be at the tentative vertical dimensionof jaw separation(by using the ways he trained on it).

- ❑ Patient slowly closes
- ❑ Operator uses tactile senses to ensure the mandible does not translate
- ❑ Patient closes until rims are almost touching (1 mm separation)
- ❑ Ask patient to stop as soon as this position has been reached
- ❑ Hold position until set 1-2 min
- ❑ Remove both rims together

7-adjust the condylar elements of the articulator and secure them against the centric stops.

8-secure the centric relation record to the maxillary cast and position the mandibular cast.

9- Mount the mandibular cast with mounting plaster

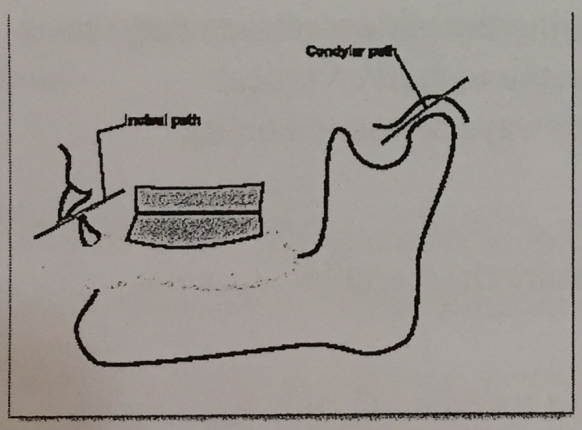
Note: if the retention of the record bases is not adequate, apply a fine dusting of denture adhesive to the wet tissue surface.

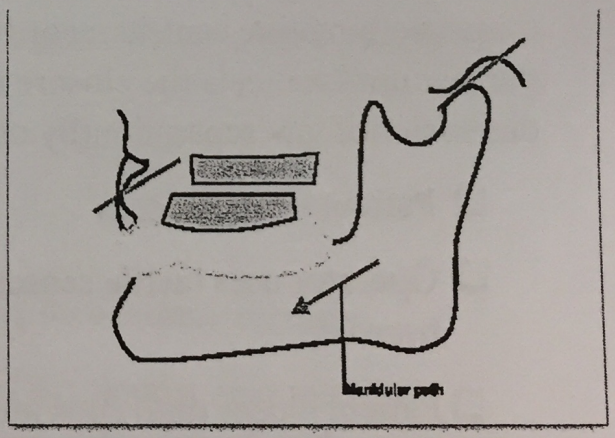
Eccentric relation records

When an articulator that adjusts to protrusion and to right and left lateral movements is used.

The purpose in making an eccentric relation record is to adjust the horizontal and lateral condylar guidance inclinations, so that the articulator jaw members can perform eccentric movements equivalent, but not identical, to the relative movements of the mandible to the maxillae. These adjustments make it possible to arrange teeth for CD in balanced occlusion.

The development of distal spaces between the upper and lower surfaces of the occlusal rims in protrusion is known as the Christensen phenomenon, and it is caused by downward/forward movement of the condyles.





The mandibular path in a forwards direction produces a downward displacement of the mandible. This means that record blocks, for instance, set on a flat plane will separate

The registration of the condylar path can be performed by means of intra-oral and extra-oral methods and with articulator adjusted accordingly. intra-oral protrusive registration done by using soft wax. Protrude a minimum of 5-6 mm and maximum of 12mm.

We do not regard recording eccentric relations as necessary for achieving clinically acceptable results. Instead, average setting of the condylar inclination on the articulator can be done (the average values given in early studies were 33 degree for sagittal and 15 degrees for the lateral condyle path inclination).

Artificial teeth arranged in their correct anteroposterior, vertical, and mediolateral positions in relation to the lips, tongue, cheeks and basal seat are more compatible to normal physiological mandibular movements.

Factors contribute to maxillomandibular relation recording inaccuracy: (centric -off)

1. Biological difficulties arising from lack of patient muscle coordination.
2. Psychological difficulties because patient &/or dentist are tired, nervous, irritable, tense or under strain to get a relaxed position of the mandible.
3. Mechanical difficulties due to unstable & poorly fitting baseplates & varying resiliency & displaceability of denture bearing tissues
4. Materials & equipments used in record making, consistency of the recording material must not be too hard. Impression plaster, Z.O.E paste & well-softened wax & other materials with soft uniform resistance have proven acceptable.
5. Using of articulators that don't accurately adjust to all lateral interocclusal check records
6. Incorrect recording technique used by the dentist & lack of dentist skill especially with difficult cases.

Try in stage in complete denture construction

Lec. 21

ا.م.د.رغداء كريم جاسم

Definition: Preliminary insertion of complete denture wax up (trial denture) to determine the fit, esthetics, maxillomandibular relations ----- etc.

Importance:

- It is the last opportunity to evaluate many of the previous steps already accomplished.
- It offers an excellent opportunity for patient education and facilitates the patient's acceptance of the finished prosthesis.

Objectives:

1. To check and verify the established maxillomandibular relationship:
    a. Verify that centric occlusion and centric relation coincide.
    b. Test for the acceptance of the established vertical dimension of occlusion.
2. To determine if the positions of the teeth and the contours of the denture bases are compatible with the surrounding oral environment.
    a. To verify the occlusal plane level relative to the ala-tragus plane horizontally.
    b. To assess the posterior arch width as it relates to the mandibular residual ridge, modiolus area, and buccal corridor.
3. To verify tooth selection and arrangement for proper esthetics and phonetics .
4. To make additional interocclusal maxillomandibular records if needed for further adjustment of the articulator e.g. protrusive interocclusal record.

The various aspects of the try-in procedure:

- Extraoral examination of the trial dentures.
- Intraoral examination of the trial dentures.

Extraoral examination of the trial dentures

1. On the articulators

The mounted case is checked for:

a)Maintaining of the vertical dimension of occlusion

- Top of the incisal pin is flush with the upper member of the articulator.
- The incisal pin is in contact with the incisal table .

b) The mounting rings are firmly screwed in their position

c) Moving of the articulator smoothly from centric to eccentric positions without cuspal interlocking.

d) When the articulator is locked in centric, no other movements are permitted other than simple hinge movement.
e) The trial denture bases lie properly on their casts and the teeth meet evenly in centric .
f) If the case is mounted on the adjustable articulator, the sagittal and lateral condylar guides should coincide with the readings obtained from eccentric jaw relation records. These reading are better registered on the upper cast.

2. The master cast:

As the finished denture is processed on the master cast. So the master cast should be:

A) Has good shape.
B) Free from air bubbles or scratches.
C) Free from wax debris which lead to improper adaptation of the trial denture bases leading to false relationships.
D) If there are any undercuts present in the cast, these undercuts should be reviled to avoid scratching the cast by the trial denture bases.

3. The trial denture bases

Check the following:

□The trial denture bases must be stable.
□The borders of the trial denture base should be smooth, round, and have no sharp edges.
□Also the border should be shaped to conform to the depth and width of the sulci.

4. The teeth

a) The dentist responsibility to select the proper shade, and mould of the teeth to determine that the teeth is stetted correctly .
b) Elimination of the excess wax to avoid the camouflages of the teeth relationships to overlook the occlusion.
c) The relation of both upper and lower teeth to the opposing ridges must be checked: if there is excessive anterior tooth contact on the articulator, should be corrected to avoid the excessive forces on the maxillary anterior ridge which causing bone destruction in that area that is already a target for bone loss .
d) denture occlusion:

The occlusion of the teeth on the articulator should meet the following in the class I jaw relationship:

□The upper anterior teeth overlap the lower anterior teeth by about 1 – 2 mm, in both horizontal and vertical planes.
□The mandibular incisors do not protrude beyond the labial vestibule, and should present a curve when viewed from the

occlusal surface this curve depends on the shape of the underlying alveolus.

- The lower posterior teeth should be set vertically on the ridge (not lingual to not interfere with the tongue), also the central grooves of mandibular posterior teeth should be on the crest of the ridge (better stability.(
- The posterior end of the occlusal plane should be located at the junction between the middle and the distal thirds of the retro molar pad; also the height of the occlusal plane coincides with the line joining the incisal tip of the mandibular canine to the retro molar pad .
- Uniformly balanced occlusal contacts between the maxillary and mandibular posterior teeth, and maximum intercuspation between upper and lower posterior teeth when checked from both buccal and lingual aspects.

After being satisfied with the case on the articulator:

Intraoral examination of the trial dentures

To reduce the risk of cross- contamination, the trial denture should in a suitable antiseptic solution, washing in running water, before inserted in patient mouth.

1. Checking the trial dentures separately :
    a. Trying- in the upper trial denture.
    b. Trying- in the lower trial denture.
2. Checking the upper and lower trial dentures together .

Extension of trial Denture base:

a) The labial and buccal extension:

- If marked overextension of the flanges, will stretch the sulcus tissues when denture inserted, leading to elastic recoil result in dislodgment of the denture, immediate denture displacement after its seating

Examination of the extension :

Insert of the upper trial denture in its place with light pressure on the occlusal surface, move the check in functional movement. Release of the pressure, the denture will falls down. Need adjustment till little or no movement occurs

- Also under extension of the upper trial denture, leading to poor physical retention. Correction will usually entail making a new final impression.
- Provision of the frena {labial and buccal} should be done to ensure that they have adequate clearance and the denture should be thinned and blended in these areas.

b) Posterior extension:

The posterior border of the upper trial denture base should extended from the hamular notch to the other along the vibrating line of the soft palate,

and correctly placed on the master cast. If the posterior palatal seal area is not done before. It should be done at this stage .

Retention:

It is noted that the retention of the trial denture is less than that of completed denture, due to:

Absence of a posterior palatal seal.

Poor adaptation of the trial denture base to the tissues.

The trial denture should be stay in position when the mouth is opened. Looseness of the upper trial denture make it impossible to carry out an accurate assessment of the occlusion {may use denture fixative} especially, in patients with unfavorable anatomical factors.

How to test the retention of the upper denture?

- Seat the upper trial denture with a firm upward and backward pressure.
- Allow the tissues to settle around the denture
- Grip the labial and lingual surfaces of the upper denture teeth between the thumb and forefinger
- Apply a firm downward vertical pull to dislodge the denture away from the tissues, {if the retention is good, dislodgment of the trial denture may be difficult{

The shape of the polished surface on the buccal surface should take the form of a gentle concavity to aid denture retention.

Retention contributing factors are:

- Absence of a border seal resulting from under extension of the denture base.
- Inadequate width of the flange
- Ineffective seal at the posterior border
- A poor fit of the denture base.

Stability:

It is tested by applying pressure in a tissue ward direction with the ball of the index finger in the premolar and molar regions on each side alternately. This pressure must be directed at right angles to the occlusal surface where displacement does occur.

Causes of instability:

- Warpage of the denture base.
- Posterior teeth set buccal to the underlying alveolar ridge
- Hard unrelieved area in the midline e.g. torus palatinus.

Orientation of the occlusal plane:

Properly oriented occlusal plane is important to:

- Patient esthetics.

- Patient comfort
- Chewing function
- Balance of occlusion

Orientation of the anterior end of the occlusal plane is determined by esthetics.

- The amount of the upper anterior teeth that will be seen during speech and facial expression depends on length and movement of the upper lip. If the upper lip is relatively long, the natural teeth may not be visible when the lip is relaxed or even during speech. The reverse is true. The movement of the lips during function varies considerably among patient thus, when artificial teeth are placed in the same position as the natural teeth, the amount of the upper teeth that will be visible varies for each patient.
- The lower lip is better guide for the vertical orientation of the anterior teeth than the upper lip. In most patients, the incisal edges of the natural lower canines and the cusp tips of the lower first premolars are located at the level of the lower lip at the corner of the mouth when the mouth is slightly open. When the lower teeth are above the lip at the corner of the mouth so it may be due to one or a combination of the following conditions:

a) The plane of occlusion may be too high.
b) The vertical overlap of the anterior teeth may be excessive.
c) The vertical space between the jaws may be excessive.

The posterior end of the occlusal plane should be at the level of the anterior two thirds of the retro molar pad .

The final check of the occlusal plane level is to determine whether the plane of occlusion is appropriate cosmetically for the patient in general }At rest, during speaking, and smiling.{

Denture base extension:

The lower trial denture extension should be tested with the patient mouth is opened no more than half opened position. To allow the surrounding musculature is in an acceptable state of relaxation.

- Labial and buccal extensions are checked as for the upper trial denture.
- Lingual extension is checked as follows:

The distolingual area:

Ask the patient to protrude the tongue to moisten the lips. If the denture base lifts at the back so, the lingual pouch is overextended.

The lingual flange area:

Ask the patient to move the tongue to bring the tip of the tongue into contact with the check on each side so, any displacement of the trial denture which arises note the site which extent.

The under extension is determine by the intraoral examination as the depth of the sulcus will be greater than that of the denture flange.

The lingual frenum area:

Ask the patient to curl the tongue backwards to touch the posterior palatal tissues by the tongue tip; if the trial denture lifts in the front, it is overextended.

In all cases the denture flanges should be reduced in depth and / or thickness until displacement no longer arises.

Posterior extension:

The lower denture should cover the retro molar pad to buttress the denture against the backward pressure of the lower lip.

Retention:

Usually the lower denture retention is poor when compared to the upper denture due to:

1. Small denture bearing area
2. The difficulty in obtaining an efficient border seal.

Testing of the lower trial denture retention:

a) Ask the patient to open his mouth slightly and let his tongue touch the cingula of the lower anterior teeth, support the chin of the patient with the left hand and pull the teeth straight upwards to check the retention of the anterior labial and lingual flanges.

b) Tilt the lower trial denture outward from the canine region to test the retention of the opposite retro molar pad.

Stability:

- Stability of the lower trial denture is checked under occlusal stresses as for upper denture.
- Also, observation of the relationship of the tongue to the occlusal surface of the lower denture, the lateral margins of the tongue should be seen to be lying over the occlusal surface of the posterior teeth .

Tongue space:

Natural teeth occupy a position in the mouth where the inward pressure of the lips and the checks is neutralized by an equal and opposite outward pressure of the tongue, and it is in this zone of neutral pressure that the artificial teeth must be set (neutral zone.(

N.B. To check for the neutral zone in the patient s mouth, let the patient open his mouth half-way and touch the lower anterior teeth with the tip of his tongue, while his tongue is relaxed. Feel the amount of pressure exerted by the tongue and check on the lower teeth, using a plastic filling instrument. Pressure should be roughly equal on the lingual and buccal sides of the teeth.

Relation between neutral zone and ridge crest:

The crest of the edentulous ridge changes according to the pattern of ridge Resorption, while the position of the neutral zone remains fairly constant. In Case of excessive resorption of the ridge labially, the crest of the ridge may thus moves lingually. Setting of anterior teeth on the crest of the ridge may then interfere with the position of the neutral zone. This result in a sunken lip, Distorted facial appearance and crowing of the tongue.

The back teeth should lie in the neutral zone to avoid check and tongue biting. Naturally the upper posterior teeth overlap the lowers buccally. The upper buccal Cusps push the check away from the occlusal table, while the lower lingual cusps keep the tongue away from the occlusal table.

During chewing, the food lie on the occlusal surfaces of the lower teeth, as the mandible closes, the crushed food escape both to the buccal and lingual. The tongue and the buccinators muscles team up to push the food back onto the food table. If the teeth are too far buccally, the tongue cannot function properly; if the teeth too far lingually, the buccinators cannot function well and the food will pile up in the buccal pouch .

The tongue is more mobile than the checks will cause greater instability of the lower denture.

Lack of tongue space (cramped tongue:(

Cramped tongue may be due to:

1. Posterior teeth set lingually to the neutral zone.
2. Posterior teeth tilted lingually
3. Posterior teeth too broad bucco-lingual.

Testing of the tongue space

As the patient to raise the tongue. If the tongue is cramped, the denture will begin to rise immediately. As the tongue moves it tries to expand laterally and whenever the tongue moves the denture will move. While the movement of the denture caused by lingual overextension will not be apparent until the tongue has risen some distance.

Height of the occlusal plane :

Corrects height of the occlusal plane in relation to the tongue.

- . The height of the occlusal plane in relation to the tongue should be noted. Positioning the occlusal plane below the level of the tongue allows the tongue to perform the majority of its movement above the denture and so tends to keep the denture down in place .When the tongue is relaxed it should rest on the occlusal surfaces of the teeth which will favor the retention of the lower denture
- If the plane of occlusion is well above the tongue, the patient may have significant problems shifting food onto the occlusal surfaces of the

teeth while eating. This impairs the patient's masticatory efficiency and comfort while eating. The greater the height of the lower denture, the longer will be the lower anterior teeth, so greater the surface exposed to the pressure of the lower lip.

- If the occlusal plane is too low, then the tongue will completely overlap the lower teeth and cause tongue biting.

To check the height of the lower occlusal plane:

Ask the patient to relax and place the tip of the tongue without undue pressure behind the lower anterior teeth which is the normal relaxed position of the tongue, and then opens his mouth without changing the position of the tongue. The height of the occlusal plane is acceptable when the relaxed tongue is seen to lie on the top of the lingual cusps of posterior teeth.

Checking both upper and lower trial dentures together

It is usually advisable to insert the lower trial denture first and then the upper because there is less chance of having the upper denture drop down.

A – Evaluation of the vertical dimension of occlusion:

To evaluate the rest vertical dimension ,

- The patient should be seated in an upright position.
- The patient head is not supported by the headrest (the headrest may affect the physiologic rest position of the mandible so, it effect the amount of interocclusal distance.

A combination of methods to evaluate the vertical dimension of occlusion would likely give a more accurate evaluation after the artificial teeth have been arranged.

Some of these measures include:

- Facial measurements
- Phonetics
- Esthetics
- patient's proprioception

a - Facial measurement:

Instruct the patient to wet his lips, swallow, and then allow his mandible to rest. While the patient is in resting position, part his lips to see whether his teeth are touching, or there is adequate space between his teeth .

N.B before parting the lips caution the patient not to move any part of his mouth or jaw

If the teeth are in contact while the mandible is at rest, the vertical dimension of occlusion is high and need a new record of vertical dimension of occlusion.

B – Phonetics:

It is difficult to locate speech problems at the try-in stage because the tongue and lips do not react the same with the wax as they do with the finished and polished denture base. But to accept the correct vertical dimension, the patient should put through a series of phonetic test.

1 – Evaluation of the "closest speaking space:"

Ask the patient to say s,s,s or count from 50 to 60

- If the teeth make contact during speech, indicate that there is not enough interocclusal distance between the teeth.
- If there is whistling during saying sss, so the vertical dimension of occlusion may need to be increased or the position of the anterior teeth changed.
- If the anterior or posterior teeth contact during speech, the vertical dimension of occlusion needs to be decreased.

2 – Instruct the patient to pronounce "j" "ch"

- Because these sounds used as guides to the adequacy of the horizontal and the vertical overlap of the anterior teeth.
- If there was inadequate space, the mandibular teeth might clash with the maxillary teeth.

3 – Instruct the patient to say "th"

}The tongue should protrude to occupy the interocclusal space {

- If the interocclusal space is less than 2 – 4 mm the anterior teeth may be placed too far anteriorly or the vertical overlap may be so great that there is insufficient space for the tongue to protrude between the teeth.

4 – Instruct the patient to pronounce "m" rapidly

The mandible should remain stationary while the lips contact each other to make sound.

5 – Instruct the patient to say "f" or "v "

To evaluate both the anterior – posterior and superior – inferior position of the maxillary teeth.

- If the incisal edges of the upper anterior teeth contact the lingual side of the lower lip, so the upper anterior teeth are set too far lingually or the lower anteriors are set too far labially.
- Difficulty in making contact between the lower lip and upper teeth usually indicates that the maxillary anteriors must be moved downward.
- The upper teeth are placed too far inferiorly if the incisal edges depress the lower lip when the "f" and "v" sounds are formed.

– 6Instruct the patient to pronounce "t" and "d "

These sounds are farmed by contact of the tip of the tongue with the anterior palate and lingual surfaces of the upper anterior teeth.

- If the upper teeth are placed too far lingually the "t" will tend to sound like a "d."
- If the teeth are set too far labially, the "d" will sound like "t."
- There is over opening or over closing which will need to be corrected by determination of a new vertical dimension .

C – Esthetics:

Facial form is an important guided to whether the patient is at the correct vertical dimension of occlusion

- If the appearance of the patient from the front face and the lateral view when the mouth is closed is like an old man (approximation of the nose and the chin) this indicated low vertical dimension.
- If the patient appear with his facial muscles are stretched, this indicated that there is high vertical dimension.

D – Patient's proprioception:

Ask the patient:

- If he has the feeling that the teeth touch before his jaws are closed far enough, this indicate high vertical dimension.
- If he feels that he closed too far before the teeth touch, this indicate low vertical dimension.
- If he feels that the teeth touch at about the right moment this means that it has correct vertical dimension .

Correction of the vertical dimension of occlusion:

- If the interocclusal distance is too large it may be corrected by adding appropriate thickness of wax to the occlusal surfaces of the posterior teeth of the lower denture, (adjusting the wax to produce an even occlusion at the desired occlusal face height and then recording the jaw relationship in centric relation.(
- If the interocclusal distance is too small or absent, posterior teeth will be removed from one of the trial dentures, and replaced with a new wax occlusion rim before a new record is made. However note should be taken of the relation between the upper and the lower anterior teeth, if it reached a point which prevent more closure, so the anterior teeth should be removed from the lower trial denture and replaced with wax occlusion rim {occlusal plane should be examined, if it is correct all alterations should be done on the lower occlusal plane, if it is not correct so a new one is made}. The wax occlusion rim is trimmed to occlude with the opposing teeth at the new vertical dimension.

Procedures:

- The trial dentures are inserted in the patient mouth; adjust the occlusion rim until the patient closes the mouth to bring the upper posterior teeth into contact with the occlusion rim on the lower trial

denture in the centric jaw relation. When the new position of occlusion is achieved, adding softens wax to the occlusion rim and the patient is asked to close back in the correct centric position .

- After making the new registration, the lower cast is detached from the articulator and is remounted on the articulator by means of the new centric record.

N.B. if the case is mounted on an adjustable articulator with a kinematic face-bow, it may be possible to open or close the vertical dimension 1 – 2 mm on the articulator without taking new records from the patient, since such changes of vertical dimension occurring in the patient may be considered as a simple hinge-type movement

B – Evaluation of the centric occlusion position

- If the maxillomandibular relation wax correctly recorded, the teeth should interdigitate in the mouth in exactly the same manner as they do on the articulator, when both condyles occupy their most posterior functionally unstrained position in the glenoid cavity.

- If the opposing cusps fail to interdigitate, when the denture is inserted in the mouth, this will indicate that the previous centric jaw relationship record wax incorrect. In such a circumstance a new centric jaw relationship record will have to be recorded .

To check the centric occluding relation:

- Ask the relaxed patient to touch the posterior edge of the upper denture base with the tip of his tongue and slowly close the teeth together.
- This procedure puts the jaws in centric relation .
- The lower trial denture can be stabilized in its place by placing the index fingers of both hands on the trial denture flanges in the premolars region, while the thumbs are held gently under the lower border of the mandible.
- When the jaws are in centric relation, the teeth should interdigitate accurately and each cusp should be situated in its corresponding fossa. The tip of the cusp should meet the deepest part of its corresponding fossa. But the initial contact between teeth is cusp incline to cusp incline, an anteroposterior shift of the mandible or denture is affected. This means that the centric relation of the jaws is not in harmony with centric occlusion of the teeth .

If there will be an anteroposterior shift of the mandible or denture and the teeth seem to occlude properly. This is misleading and may get one of these possibilities:

- The mandible will be shifted forwards or laterally out of centric relation position and the teeth occlude in centric occlusion. Here centric occlusion does not coincide with centric relation.

- The lower denture will be shifted out of its place, while the mandible remains in centric relation. This is a wrong centric occlusion.

- Anterior displacement of dentures is more likely to occur with the lower denture, as its retention is poor compared with that of the upper denture .

- Both upper and lower dentures are shifted out of their places, while the jaws remain in centric relation. In this case the teeth are in centric occlusion, but the dentures are not properly seated on their supporting area. This is a wrong recording of centric occluding relation.

Correction of centric occlusion / relation disharmony

- When errors of occlusion are noted at the try-in stage. A new recording of centric relation position should be obtained after the teeth from one of the dentures have been removed and replaced with a wax occlusion rim.
- If the teeth are not removed there is a danger that the cusps will guide the mandible back into an incorrect tooth position.
- Before carrying out any modifications in the trial dentures the dentist should determine first whether or not the occlusal plane of the upper trial denture is correct.
- If it is, the alterations will be carried out on the lower trial denture. If the plane is not correct, the upper trial denture will have to be modified by resetting the anterior teeth or replacing the teeth with a wax occlusion rim.

Procedures:

- The trial dentures are returned to the articulator and all the posterior teeth from one of the dentures are removed and replaced by a new wax occlusion rim which should be trimmed to occlude with opposing posterior teeth without altering the original vertical dimension as set on the articulator.
- The trial dentures are then placed in the mouth and the patient is asked to close them together, thus, impressing the cusps of the opposing teeth into the soft wax.
- When correcting a lateral swing, care must be taken to ensure that the lower anterior teeth do not impinge on the upper anterior teeth, as this may cause the mandible to be guided into incorrect position, or the dentures to tilt.

- If any contact of the anterior teeth occurs the offending lower anterior teeth should be removed and the position is retaken.
- After making the new centric registration, the lower cast is detached from the articulator and is remounted with the new centric relation record.
- Dentures should then be checked at a subsequent visit of the patient for trying-in the dentures before processing them .

C - Evenness of occlusal pressure

- As the teeth come together, they should occlude evenly with equally distributed pressure all a round.
- However, local compression of the tissues creates the appearance of apparent equilibration of tooth contacts when they may not in fact exist.

Factors contributing to uneven occlusal pressure:

Unevenness of occlusal pressure may result from any of the following factors:

1-Unequal pressure on the record blocks during registration of the maxillomandibular relations .

2 – Errors in seating the record blocks on their respective master cast due to:

- Warpage of the record bases.
- Presence of wax debris on the master casts preventing proper seating of the record bases.
- The record bases are touching at the casts heals preventing the teeth from coming into occlusion .

3 – Errors in mounting the master cast on the articulator due to the presence of interference at their posterior region .

Such irregularity of occlusal pressure may not notice at the try – in stage according whether it is slight or considerable. If the denture is processed as such, the teeth will be held apart at the area of heavy pressure, this will require excessive grinding to equalize the uneven pressure.

Testing the evenness of occlusal pressure:

Several tests have been suggested to verify the evenness of occlusal pressure such as:

- Place two pieces of thin celluloid strips between the posterior teeth on each side, ask the patient to close firmly and then try to pull the strips, any difference in the force required to remove the strips is interpreted in terms of difference in occlusal pressure.
- Stabilize the upper and lower dentures with the thumb and index fingers of both hands. Request the patient to close gently and slowly, and to stop closing at the first tooth contact. Try to see the first contact and feel the dentures rise from their basal seats.

- Gross error in recording the occlusal position may be tested by inserting the blade of the wax knife between the occluding surfaces of the upper and lower posterior teeth on both sides.
- Excessive pressure in the molar region may be tested by inserting the point of a wax knife between the upper and lower incisor teeth and attempting to push the upper trial denture upwards and the lower trial denture down. This test will reveal whether the front part of the denture is rising slightly from the ridges when the posterior teeth are occluding.

Correction of unevenness of occlusal pressure:

If the error is slight:

- Gently soften the wax supporting the teeth of one denture on the offending side (heavy pressure side.(
- Insert the trial dentures in the patient mouth, and hold the lower denture firmly in place.
- Ask the patient to close. The teeth on the side of heavy-pressure will sink slightly into the softened wax until the occlusion on the opposite side arrests them, thus equalizes the occlusal pressure.
- The trial dentures sent directly to the processing procedure without putting on the articulator. This method has the disadvantage that it will be difficult to carry out laboratory remounting and selective grinding.

If the error is gross

- A layer of softened wax is added between the occlusal surfaces of the teeth on the side of light or no occlusal contact and the patient is asked to close until the teeth on the opposite side will stop them, equalizing the occlusal pressure. This is followed by remounting of the lower cast and correcting the occlusion on the articulator. Or
- The posterior teeth are removed from one denture and are replaced by a wax occlusion rim which should be trimmed to occlude with the opposing posterior teeth without altering the original vertical dimension of occlusion as set on the articulator. Then a new record of the retruded contact position is taken and the lower cast is remounted on the articulator for correction of the occlusal discrepancy .

D – Evaluation of esthetics:

One of then main objectives in complete denture prosthodontics is to produce a harmonious appearance of the denture when view the patient from the front face and lateral view when the mouth is closed and also in a half open position. To evaluate the teeth while the patient rests, speaks, and smiles. This assessment is important because dentures which have pleasant appearance may suddenly become unsuitable if the patient moves his lips during function.

To achieve the best esthetic results certain aspects of appearance have to be checked as a routine:

The midline:

The midline of the upper and lower trial dentures is evaluated in relation to the midline of the patient's face. If it is incorrect, the upper and lower teeth will have to reset to correct it.

Smile line :

The incisal edges of the maxillary anterior, and premolars should form a smile line which is consistent with the age, sex, and personality of the patient. This curvature tends to decrease with age, and also tends to be flatter in men than in woman. When the patient's smiles, the maxillary teeth should just touch the lower lip and should follow its curvature. The reverse smile line or curvature should always avoid.

Corners of the maxillary arch:

- The maxillary canines should be located at the corners of the mouth.
- A buccal corridor should be evident between the teeth and the cheek .
- The patient must not exhibit an ear to ear smile.

Verify tooth selection:

- The appearance of the denture includes the shade, mould, and size of the teeth, the orientation and level of the occlusal plane and hence, the amount of the tooth visible and the degree of lip support.
- If the shade and arrangement appear unnaturally uniform, mixing shades and moulds may be indicated.
- In some patients the upper labial flange will be visible during speech and smiling. In this case, a natural appearance will be achieved when the acrylic flange is contoured to resemble natural gum and the acrylic flange is slightly irregular or stippled to break up any reflections.
- The upper portion of the labial flange should be thin, because an actual vestibule does not usually exist at the mucobuccal fold.

Regularity of anterior teeth:

- The anterior teeth should not be placed so that the incisal edges are all at the same level.
- Some form of crowding should be usually present in the arrangement of the anterior teeth. This may be varying from minimum irregularity to marked overlapping of the teeth.
- Create the final appearance by detailed arrangement of the anterior teeth, shaping the gingival margins and, where necessary grinding the incisal edges.

Patient need to see te final trial denture by mirror

Prosthodontics

Lec: 23

Insertion of CD

الاستاذة الدكتور رغداء كريم جاسم

This stage involves all the procedures involved in denture construction are subject to review and reevaluation .starting from the choice of materials, the technical and clinical effectiveness of procedures used.

The skills in carrying out the procedure are exposing to three evaluations:

- By the dentist
- By the patient
- The friend and associates of the patient who will view the result.

Dentist evaluation

This is very important since the dentist is the only one responsible for the work, responsible for failure and success of final work.

Patient evaluation

Patient evaluate the denture when placed in the mouth .it may be affected by the comments of the other people .also the patient can sense carelessness or hastely performed procedure just as they can sense care used in all steps of denture construction.

FRIENDS' EVALUATIONS

When patients leave the dental office with their new dentures, it is generally with mixed emotions. They want their friends to notice their improved appearance: they hope their friends and relatives will compliment them and confirm their judgment in the choice of dentist they have made,

The evaluations by friends of patients may not be accurate

1. Friends cannot know how the dentures feel
2. They cannot judge the efficiency of the dentures in eating and speaking
3. Thev cannot know the difficulties encountered by the dentist because of the poor foundation on which the dentures have been built.
4. Thev cannot understand the possible lack of coordination of the patient in attempting to follow instructions or to use the dentures.
5. The patients themselves mav recognize these difficulties as partly their responsibility, but the comments friends may cause them to blame the dentist for problems that may have been beyond the dentists control.
6. Such well-meaning friends can add to patient's difficulties because they have not been exposed to the information supplied to the patient by the dentist during the course of constructing the dentures.

Complete denture insertion procedure

✓ *Inspect the dentures*

Prior to placing of the denture in the patients' mouth the denture should be inspected

1- Fitting surfaces of the completed dentures must critically examined for small projections caused by discrepancies in the cast or in the investing material .this is done using Magnifying glass, digital inspection of the denture bases,

2-denture borders, especially the frenal notches, must be examined carefully sharp edges. Sharp borders in the frenal notch must be carefully rounded before the initial placement of the dentures.

3- Polished surfaces must be carefully examine the polishing perfectly done by the technician.

✓ *Treatment at the Time of Denture Insertion*

A-Elimination of Impression(tissue urface) Surface Errors

The use of pressure indicator paste is essential to evaluate the accuracy of tissue contact. It is especially helpful when bilateral undercuts on the residual ridge interfere with the initial placement of the denture or when pressure spot were present or suspected in the final impression.

The patient should have been instructed to keep any previous dentures out of the mouth for 12 to 24 hours immediately before the insertion appointment. This is essential if the new dentures are to be seated on healthy and undistorted tissues if the tissues are being distorted by old denture. The new ones will not seat perfectly even if they fit perfectly. Improper seating of dentures at this time can cause the appearance of errors in occlusion or fit that would not exist if the tissues were undistorted. Adjustments of any type to correct such apparent errors, if made at this time, may be unnecessary and can cause irreparable damage to the dentures.

Procedure for use pressure indicating paste as follow:-

1) The paste is brushed on the tissue surface of the denture base in a thin layer so the brush marks are visible and run the same direction. In this manner, tissue in-rushed on the tissue surface of the denture base in a thin layer so the brush marks are visible and run the same direction. In this manner, tissue interferences during placement of dentures pressure on the residual ridge can be more easily interpreted than without the paste

2) The painted surface is either sprayed with a silicone liquid or wetted with cold water.

3) The denture is carefully placed in the mouth and pressure is applied by the dentist on the teeth to reveal any pressure spots in the denture base that would displace soft tissue.

4) A repeat recording should be made for verification of pressure spots,

5) The denture base carefully relieved when. Tissue interferences are present; the denture coated with pressure indicator paste is seated until resistance is met.

6) The marks in the paste indicate where the denture base should be relieved to accommodate the interference.

7) Pressure indicator paste should be used for every new denture and any necessary adjustments should be Made before proceeding with occlusal adjustments

B-Test for retention of dentures

This is done by dentist finger check for posterior and anterior retention

C- **EQUILIBRATION OF OCCLUSION**

The occlusion of all complete dentures is perfected before the patient is allowed the dentures. (Extra -oral selective grinding).

The purpose of the remount and selective grinding is to eliminate all areas of interference between the maxillary and mandibular teeth, so that each tooth bears the proportionate occlusal load. **A well balanced, smooth functioning occlusion is probably the most important single factor for successful dentures.**

Errors in occlusion can result from a number o factors. These include

A- change in the state of die temporomandibular joints (TMJs), inaccurate maxillomandibular relation records by

- ✖ The dentist errors in the transfer of maxillomandibular relation records to the articulator.
- ✖ ill-fitting temporary record bases
- ✖ , failure to use the face-bow (with subsequent need to change the vertical dimension of occlusion on the articulator)
- ✖ , incorrect arrangement of the posterior teeth,

- ✖ failure to close the flasks completely during processing, use of toe much pressure in closing the flasks
- ✖ or warpage of the dentures by overheating denture polishing.

All of these are errors in technique on the part of the dentist or laboratory technician. These errors in occlusion must be eliminated before the dentures are worn, so the soft tissues interposed between the bone and die denture "bases will not be distorted by discrepancies in the occlusion.

B-Further errors in occlusion may develop after dentures have been worn. The acrylic resins of which the denture bases are made absorb water. When this occurs, the bases expand sightly altering the relationships of the inclined planes of the cusps of anatomical (cusped) teeth. When the residual ridges supporting the dentures are favorable, this altered relationship may not be noticeable to the patient

Some of the error in occlusion can be eliminated by

☒ Placing the cast with the processed denture still on them, in their original mountings n the articulator, and modifying the occlusal surfaces of the teeth by **selective grinding** this will eliminate most of the errors that are due to processing changes. However, it will not eliminate errors produced by the impressions or jaw relation records nor will it eliminate errors that develop when the dentures are removed from the cast or are polished. Therefore new interocclusal records of centric and eccentric relations should be made at the time new dentures are first inserted in the patients' mouth.

☒ If one or both of the residual ridges are badly resorbed. The patient may experience soreness under the dentures as a result or malocclusion. In this situation, the dentures should be remounted in the articulator with new interocclusal records of centric and eccentric relations and the occlusion should be corrected by further selective grinding.

The side effect of error in occlusion

Maxillomandibular relations are bone-to-bone relations and as such represent the status between two solid objects—the maxillae and the mandible. These bones are covered by mucosa and submucosal tissues, which are resilient and displaceable. Because of this displaceabilitv, some dentists have considered that the dentures will settle into the tissues and small errors in occlusion will correct themselves. If this is true, it is done at the expense of the health of soft tissues and eventually at the expense of bone, because bone is a more plastic tissue than mucosa. Bone, in time, will change to relieve soft tissues of excess pressure. Thus, failure to correct occlusion before the patient wears dentures can cause destruction of the residual alveolar ridges.

INTEROCCLUSAL RECORDS FOR REMOUNTING DENTURES

The dentures must be remounted in the articulator via accurate interocclusal records (CR and protrusions are necessary for this procedure) for the selective grinding necessary in perfecting the occlusion.

As stated previously, the errors in occlusion should be eliminated on the articulator rather than in the mouth inorder that:

1. If these corrections are attempted in the mouth, it is difficult to see the errors because the soft tissues will be distorted and obscure the errors, and the articulating paper will not mark efficiently. Because the soft tissues under the dentures are resilient, the denture bases shift in relation to the underlying bone when there is an error in occlusion and the opposing teeth contact each other. The articulating paper marks are likely to be incorrect and. more important. the control of jaw position depends entirely on die ability of the patient to place and move die jaw correctly. much of die selective grinding done according to articulating paper marks made in the mouth actually increases the amount of error in the occlusion. When new accurate interocclusal records are made, and the completed dentures are remounted on the articulator, the errors in occlusion are easily visible. easily located, and easily corrected by selective grinding. Properly made interocclusal records will not cause the denture bases to slip or rotate in relation to their bony foundations. Furthermore, on the articulator, the dentures will be firm on their remount casts. The points of contact and errors of occlusion can be observed visually with magnification if desired and articulating paper marks are quite eir_r made on the drv teeth.

2. There is another advantage to making the corrections without the patient present. The occlusal records, of course, are made in the patient s mouth; and from the patient s stand:-; n this is just another step in the construction c: dentures. On the other hand, if the grinding o: elusion is attempted in the presence of the patient the operation mav *appear* the to patient to be amt of correcting an error made by the dentist. . there is a psychological advantage in doing the selective grinding in the laboratory.

D-Final evaluation of the contacts

When the occlusal adjustment has been completed, the contacts of the teeth are carefully evaluated in CR and the various excursive movements after careful polishing and cleaning of the dentures, they should be placed in the patient's mouth for evaluation of the contacts if all steps

have been completed correctly. The contacts will be the same clinically as was achieved on the articulator.

E- SPECIAL INSTRUCTIONS P TO THE PATIENT

- Educating patients to the limitations of dentures as mechanical substitutes for living tissues must be a continuing process from the initial patient contact until adjustments are completed.
- **individuality of patients**
  - Patients must be reminded that their physical- mental and oral conditions are individual in nature. Thus, they cannot compare their progress with new dentures to other persons' experiences. What is annoying and painful to some may be of secondary importance to others. Chewing and speech patterns with new dentures that are considered successful TO some persons may be interpreted as totally unsuccessful by others.
  - Adaptability' to new dentures is modified by age. Persons who make the adjustment to new dentures during middle age will probably experience considerably more difficulty with dentures 15 years later even though the new dentures maybe technically" superior to the original ones. In addition, Patients tend to forget the severity- of problems with the passage of time. Many persons indicate that their dentures have always been comfortable, even though they may have had a difficult adjustment period. Such remarks can be discouraging to patients with new dentures unless they have been advised of this possibility

- **Appearance with new dentures**

1) Patients must understand that their appearance with new dentures will become more natural with time.
2) Initially-, the dentures will feel strange and bulky in the mouth and will cause a feeling of fullness of the lips and cheeks.
3) The lips will not adapt immediately to the fullness of the denture borders and may initially present a distorted appearance.
4) Muscle tension may cause an backward appearance. which will improve after the patient becomes relaxed and more confident.
5) Patients should be instructed to refrain from exhibiting their dentures to curious friends until they are more confident and competent at exhibiting them at their best.

6) When patients are not careful in following these instructions, they may- likely- become unfairly- critical of the dentures and develop an attitude that will be difficult for the dentist to overcome.

7) Repositioning of the orbicularis oris and a restoration of the former facial dimension and contour by the patients appearance. This can be overcome only with the passage of time, and patients are advised to persevere during the period.

- **Mastication with new dentures**

- Learning to chew satisfactorily' with new dentures usually requires at least 6 to 8 weeks. Patients will become discouraged unless they are aware that this learning period is to be expected. New memory patterns often must be established for both the facial muscles and the muscles of mastication. Once the habit patterns become automatic, the chewing process can take place without conscious effort. The muscles of the tongue, cheeks, and lips must be trained to maintain the dentures in position on the residual ridges during mastication. Patients can be told that "these muscles must learn what they should and should not do."
- Mastication is additionally' impaired because of the excess flow of saliva for the first few days after placement of new dentures. However. in a relatively short time the salivary glands accommodate to the presence of the dentures, and the production of saliva returns to normal.
- Patients should begin chewing relatively soft food cut into small pieces. If the chewing can be done on both sides of the mouth at the same time, the tendency of the dentures to tip yyill be reduced.
- On simple types of food such as crackers, soft toast, or chopped meat and that no attempt should be made to masticate more resistant foods. Also during the learning period, patients are advised to avoid observation by friends or members of the family, because the patients will be awkward in the beginning phases of chewing and susceptible to embarrassment and discouragement. Kindly but misplaced joking remarks and comments by- members of the family mav readily lead a patient to denture consciousness that will be reflected in the attitude toward the dentist and the dentures. When biting with dentures, patients should be instructed to place die food between their teeth .
- Occasionally edentulous patients have gone without dentures for long periods and have learned to crush food between the residual ridges or perhaps between the tongue and the hard palate. These persons

usually experience increased difficulty in learning to masticate with new dentures, and the time for adjustment will likely be extended.

- Patients should be told that the position of the tongue plays an important role in the stability of a lower denture, particularly during mastication. Patients whose tongues normally rest in a retracted position relative to the lower anterior teeth should attempt to position the tongue farther forward so it rests on the lingual surfaces of the lower anterior teeth. This will help develop stability for the lower denture.

- **Speaking with new dentures**

1) Fortunately the problem of speaking with new dentures is not as difficult as might be expected.
2) The adaptability of the tongue to compensate for changes is so great that most patients master speech with new dentures within a few weeks. If correct speech required exact replacement of tissues and teeth in relation to tongue movement, Even a 0.5- mm change at the linguogingival border of the anterior teeth would cause a speech defect, especially in the production of **s** sounds,
3) Speaking normally with dentures requires practice. Patients should be advised to read aloud and repeat words or phrases that are difficult to pronounce. Patients usually are much more conscious of small irregularities in their speech sounds than those to whom they are speaking.

- **Oral hygiene with dentures**

1) Patients must be convinced of the importance in maintaining good oral hygiene for the health of the oral cavity. Plaque. Stain and calculus accrue on dentures and oral mucosa of edentulous patterns in a similar relation as in the mouths of dentulous patients.
2) Dental plaque is an etiological factor in denture stomatitis, inflammatory papillary hyperplasia, chronic candidiasis, and offensive odors, and it must be removed.
3) (Patients should be instructed TO rinse their dentures and their mouths after meals whenever POSsible Once a day.
4) it is essential that the dentures be removed and placed in a soaking type of cleanser for a minimum of 30 minutes. This time interval is required for effective killing of microorganisms on the dentures,
5) . Leaving the dentures in the cleanser overnight is even better. When the dentures are removed from the soaking cleanser, they should be brushed gently with a soft brush and rinsed thoroughly.

6) They should be brushed over a basin partially filled with water or covered with a wet washcloth to prevent breakage in case they are dropped.

7) Patients should be discouraged from using toothpastes, because most contain an abrasive material that will wear away the surface of acrylic resin.

8) The mucosal surfaces of the residual ridges and the dorsal surface of the tongue also should be brushed daily with a soft brush.

Geriatric dentistry related to prosthetic

Geriatric Dentistry:

Geriatric dentistry is the branch of dentistry that emphasizes dental care for the elderly population and focuses upon patients with chronic physiological, physical and/or Psychological changes or morbid conditions / diseases.Oral health reflects overall wellbeing for the elderly population.

GROWTH:- Growth is increase in size.

DEVELOPMENT:- Development is progress towards maturity.

MATURATION:- The stabilization of the adult stage brought about by the growth and development.

AGING Refers to irreversible and inevitable changes occurs with time

It is also defined as the sum of all morphologic & functional alterations that occur in anorganism and lead to functional impairment which decline the ability to survive stress. ATHENS & PAPAS

GERONTOLOGY:- Is the study of aging in all its aspects biologic, physiologic, sociologic & psychologic.

WHAT CAUSES AGING ?

Medvedev listed 300 theories that have been offered in an attempt to answer this but nothing conclusive comes.

The consensus today is that aging is the end result of multiple biological processes which includes

GENETIC LEVEL:- Where information for the initiation & maintaince of cellular functions are encoded.

CELLULAR LEVEL:- Where integrity of somatic cells is maintained

ORGAN&ORGAN SYSTEM LEVEL:- Where physiologic functions are performed

COORDINATION LEVEL:- Physiologic functions are controlled & assembled into complex function

FACTORS INFLUENCING AGING

A) GENETIC

1- MUTATIONS:-Several mutations reduces life span

2. SPECIES SPECIFIC LIFE SPAN:-Each species is characterized by its own pattern of aging & maximum life span

3. HYBRID VIGOR:-The effect of genetic constitution on longevity is perhaps best exemplified where hybrid vigor is demonstrated
4. SEX:- In humans\animals, female lives longer.
5. PARENTAL AGE:- Like father like son.
6. PREMATURE AGING SYNDROME:- Single gene changes results in premature senscence in humans e.g. progeria, cockayne's syndrome, werner's syndrome

B) ENVIRONMENTAL

1. PHYSICAL AND CHEMICAL:- Pollution, radiations, working atmosphere etc
2. BIOLOGICAL FACTORS:- Nutrition, general health etc
3. PATHOGENS AND PARASITES:- They influence the rate of human development → low income group \ tropical countries
4. SOCIOECONOMIC CONDITIONS:- Bad housing, stresses etc

AGING Vs OTHERS

- It has always been difficult for researchers to differentiate whether the changes in tissues/organ system are due to physiologic aging or pathologic .
- There is no precise method for determining the rate or degree of aging because

AGING

↓

SYSTEMIC DISEASES

↓

SURGERIES,MEDICATIONS,CHEMOTHERAPY,RADIOTHERAPY

↓

ALTERATIONS IN BODY

↓

CHANGES...SUPERIMPOSES

Effect of Aging on Oral Tissues (Gerontology of the Oral Cavity)

- Losses of tooth support structures (periodontium)
- increased loss of epithelium attachment
- and alveolar bone in the elderly
- temporomandibular joint,
- orofacial/mastication muscles, oropharyngeal mucosa, and oral sensory/motor nerve systems.
- salivary gland function, taste, tactile sensation and Swallowing

Often there is no clear demarcation between normal physiological aging and pathological diseases .However, there may be some specific changes in individual tissues during aging, e.g.,

Losses of tooth translucency and surface details

Abrasion, attrition, and erosion of teeth usually increase with advancing age.The dental pulp becomes smaller.

Geriatric Dentistry differs from traditional general practice in the following aspects

- It is concerned with aging patients, 86% of whom have at least one chronic disorder. (Nursing home residents may have as many as 25 concurrent disorders).
- Cognitive Dysfunction such as dementia affects compliance and oral health.

- Use of Polypharmacy causes xerostomia. (over 1000 medications cause dry mouth)
- Many elderly have physical disabilities such as vision, hearing and taste disorders.
- Requires exceptional skill in history taking.
- Challenges the dentist's ability to design treatment plan and differentiate normal aging from pathologic aging.

Pathological Oral Conditions In The Elderly

- Conditions affecting the periodontium & tooth structure.
- Ulcerative lesions.
- Denture related condition
- Xerostomia (dry mouth)
- Tongue Conditions
- White lesions
- Malignant lesions
- Vesiculo-bullous lesions
- Pigmented lesions

SALIVARY GLANDS AND SALIVA

THERE ARE 3 MAJOR PAIRED & SEVERAL MINOR SALIVARY GLANDS PRESENT IN ORAL CAVITY.

MAJOR GLANDS ARE:-PAROTID,SUBLINGUAL,SUBMANDIBULAR

MINOR GLANDS ARE:-LABIAL, BUCCAL, PALATAL

PRIMARY FUNCTION-EXOCRINE PRODUCTION OF SALIVA.

MAJOR ROLES OF SALIVA IN MAINTAINNCE OF ORAL HEALTH

- **Preparation & translocation of food bolus.**
- **Lubrication of oral mucosa.**
- **Preservation of microbial balance.**
- **Mechanical cleansing.**
- **Antibacterial &antifungal activities.**
- **Maintainance of oral ph.**

- Remineralization of dentition.
- Mediation of taste activity.

SALIVARY FUNCTION DURING AGING

There occurs a fairly linear loss of acinar cells, replaced by fatty or connective tissue.

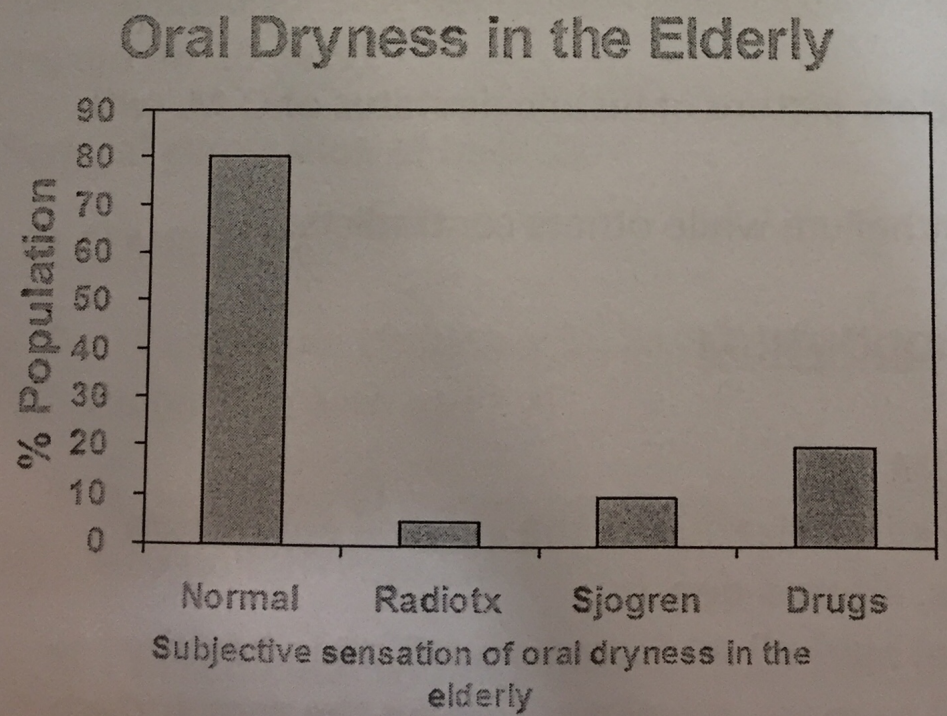
- **Submandibular gland – 40% loss of acinar cells**
- **Parotid gland - 30% loss of acinar cells**
- **Minor labial glands - 45% loss of acinar cells**

MORPHOMETRIC STUDIES SHOWS

- **PROPORTION OF GLAND PARENCHYMA OCCUPIED BY ACINAR CELLS IS REDUCED BY 25% - 30%.**
- **ATROPY OF ACINAR CELLS.**
- **PROLIFERATION OF DUCTAL ELEMENTS.**
- **SOME DEGENERATIVE CHANGES.**

Earlier ,it was thought that salivary secretion is also reduced with age but recent functional studies showed , despite the appearance of age related morph metric changes in salivary glands - Functional out put & composition of saliva doesn't appear to be consistently altered in older but otherwise healthy persons.

THE DECREASE IN SALIVARY PRODUCTION IS MORE RELATED TO SALIVARY GLAND DYSFUNCTION & RELATED ORAL MORBIDITIES ASSOCIATED WITH SYSTEMIC DISEASES & MEDICATIONS.



Subjective sensation of oral dryness in the elderly

ORAL MUCOSAL BARRIER

THE ORAL MUCOSA PERFORMS ESSENTIAL PROTECTIVE FUNCTION THAT PROFOUNDLY AFFECT THE GENERAL HEALTH & WELL BEING OF HOST.

- It provides first line of defense.

- Specialized mucosal sensory detectors serve to warn us of many potentially harmful situations such as spoiled food stuffs,temprature extremes,sharp objects,etc.

- Any changes in O.M. barrier could expose the aging host to myriads of pathogens & chemicals that enter the oral cavity

- Both histologic layers of oral mucosa,epithelium,& connective tissue have important defensive functions.

- Stratified squamous epithelium containing attached oppose cells forms PHYSICAL BARRIER which restricts entry of microorganisms & toxic substances.
- Mucosal epithelial cells synthesize KERATIN & LAMININ

LAMININ Preserve structural integrity & restore wound healing.

KERATIN (MASTICATORY MUCOSA) Protect against abrasive insults e.g. stiff foods.

But literature doesn't give clear picture of histologic status of O.M. with normal aging.

Reports says thinning of epithelium while others contradicts.

EFFECTS OF AGING ON PERIODONTIUM

A) GINGIVAL EPITHELIUM

- **Thinning & decreased keratinization of the gingival epithelium**
- **Flattening of rete pegs, altered density.**
- **Migration of functional epithelium from its position in healthy individual (on enamel) to more apical position on the root surface with accompanying gingival recession**

c) PERIODONTAL LIGAMENT (PDL)

A fibrous connective tissue that is noticeably cellular & vascular.

It 's functions are:

- ✓ Attachment & Support
- ✓ Nutrition
- ✓ Proprioception
- ✓ Synthesis

Periodontal Disease

Etiology

Gram positive and negative bacteria

Exacerbated in the elderly by diminished motor dexterity (Arthritis, Stroke) and poor hygiene

Wide spectrum range of gingivitis, inflammation of sulcular epithelium, recession to periodontal pocketing

Treatment:

Antimicrobial therapy (chlorhexidine 0.12% mouth wash, tetracycline impregnated sulcular fibers, metronidazole 500mg qid or clindamycin 300 mg qid for 10 days).

Surgical elimination of pockets.

D) CEMENTUM.

- Cementum continous be laid through out life but rate of formation diminishes with age
- A thickening of cementum is observed on teeth that are not in function (HYPERCEMENTOSIS).
- ↑ in cemental width(5-10 times) as cementum deposition is continues after tooth eruption.
- ↑ in width is greater APICALLY & LINGUALLY

E) ALVEOLAR BONE (in relation to periodontium)]

A more irregular PDL surface of bone and less irregular insertion of collagen fibers.

Healing of bone in extraction socket appears to be unaffected by aging.

F) BACTERIAL PLAQUE

Dentogingival plaque accumulation increase because increase in hard tissue surface area as a result of gingival recession and the surface characteristic of the exposed root surface for plaque formation compared to enamel

AGING AND TEETH

ENAMEL CHANGES

CHEMICALLY

- ↑ Levels of N_2 & FLOURINE' therefore,↑ organic matrix.
- Enamel near the surface become DARKER & DECAY RESISTANT
- There is reduced PERMEABILITY & enamel becomes BRITLLE.

ATTRITION It may be defined as physiological wear of occlusal or incisal surfaces and proximal contacts as a result of mastication, physiologic tooth movement, functional or para functional movements of mandible.

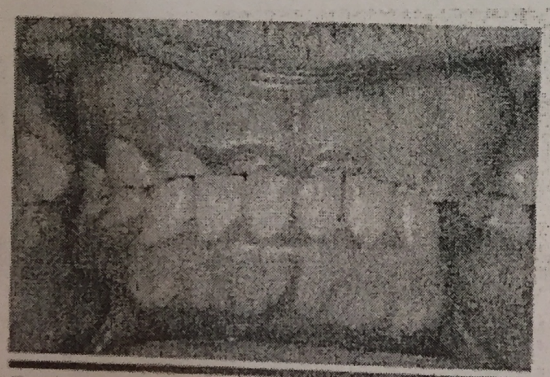
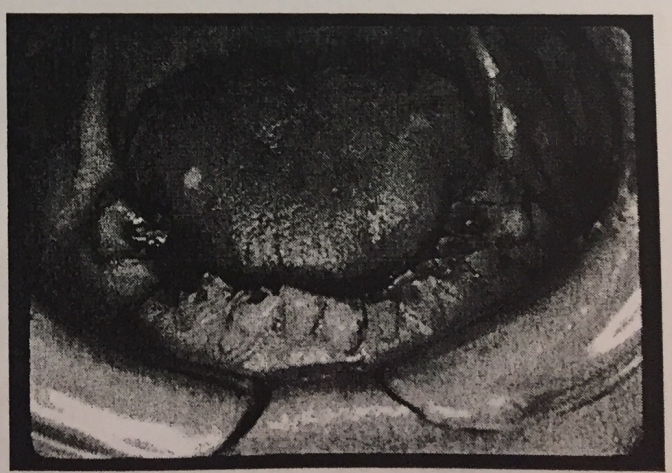


Figure 2-10 • Attrition. Extensive loss of coronal tooth height without pulp exposure in patient with anterior edge-to-edge occlusion.



CLINCAL FEATURE

a) Small polished facets on cusp tips\ridges\slight flattening of incisal edges

b) Because of slight mobility of teeth in their sockets & a manifestation of resiliency of PDL, facets also occur at proximal surface.

c) Decreased cusp height

d) Flattening of occlusal plane.

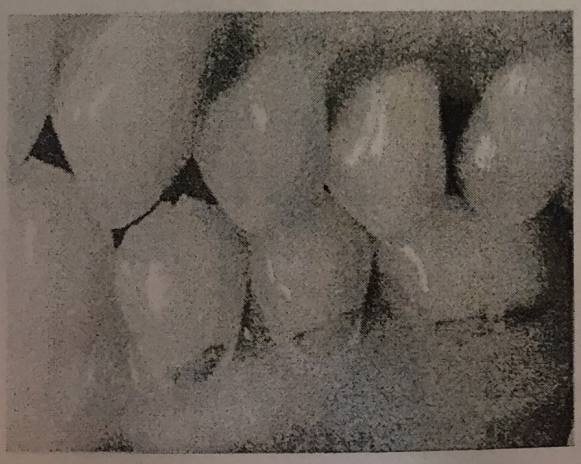
e) Shortening of length of dental arch

(All these changes occur more severely in men than women due to greater masticatory force)

ABFRACTION

RECENTLY, it has been proposed that the predominant causative factor of some of the cervical, wedge-shaped defects is a strong(heavy) eccentric occlusal force resulting in microfracture or abfracture ,such microfracture occur as the cervical area of the tooth flexes under such loads.

- **This defect is termed as IDIOPATHIC EROSION OR ABFRACTION.**





DENTIN CHANGES

- VITALITY OF DENTIN

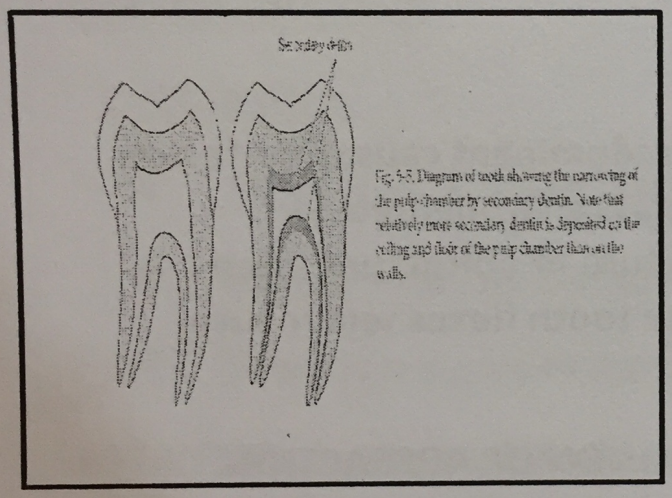
Since odontoblasts & its processes are integral part of dentin, therefore, there is no doubt that dentin is vital tissue.

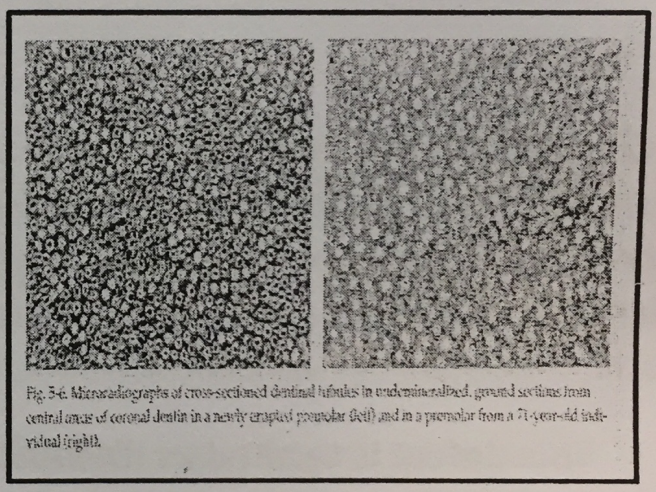
- It is laid throughout life though as age progress dentinogenesis slows.

AGING AND FUNCTIONAL CHANGES IN DENTIN

REPARATIVE\SECONDARY DENTIN

If attrition, abrasion, erosion, cavity cutting procedures causes odontoblast processes to cut or exposed, either they die or if they live they form dentin called as reparative dentin





- **This reparative dentin seals of the zone of injury occurs as a healing process initiated by the pulp resulting in resolution of the inflammation process and removal of dead cells.**
- **The reparative dentine has fewer & more twisted tubules.**

PULP CELL CHANGES:

Decrease in number, size,& cytoplasmic organelle.

Fibroblast changes

FIBROSIS

a) In aging pulp accumulations of both diffuse fibrillar components as well as bundles of collagen fibers usually appear.

b) Fiber bundle arranged

::longitudinally ---radicular pulp

::diffusely--- coronal pulp

c) INCREASED in fibers is generalized through out the pulp organ

d) Collagen increases in medial & adventitial layers of blood vessels

e) INCREASED in collagen fiber is more apparent than actual because of decreased in size of pulp which makes the fibres to occupy less space

f) vascular changes in the aging pulp is same as occur in any other organ like PLAQUE CALCIFICATIONS

PULP STONES \DENTICLES

- They are defined as nodular, calcified masses appearing in either or both the coronal or root portion of pulp organ.
- They are seen in otherwise normal tooth in other respects
- They are seen in functional as well as embedded unerupted teeth

Tooth Loss

- Not a normal part of aging.
- A consequence of oral disease:
  - Caries
  - Periodontal disease
  - Often associated with systemic diseases

Decline in Edentulous Adults

, improved and still improving dental health care has led to significant declines in the number of edentulous adults

with increased retention of teeth into old age, we are seeing more incidences of caries and other dental diseases in those teeth.

Oral Mucosa with aging

- Epithelium thinner, more fragile, less keratinised
- Loss of collagen and elastin from fibers also weaken mucosa
- Increase in pathological change - loss of tongue papillae and taste buds
- minor salivary glands diminish
- Lesions more common and slower to heal
- Inflammations, irritation and infections

TONGUE

- It seems to increase in size in edentulous mouth which may be because of result of transferences of some of the masticatory & phonetic function of the tongue.

Enlarged tongue have negative effect on retention of denture.

- There is DEPAPI LLATION which usually begin at apex & lateral border.
- FISSURING is also common.
- There is also reduction in the taste buds

Taste

Reasons for decline in sense of taste are unclear

Possible decline in number of taste buds

- Possible decline in density of taste buds
- Possible decline in sensitivity of taste buds
- Possible decline in neural processing or retrieval

All of the above also possible.

Medications Known to Interfere with Taste

Medications, including the most commonly prescribed, interfere with taste or olfactory senses:

- Antibiotics: Ampicillin Azithromycin (Zithromax)
- Ciprofloxacin (Cipro) Clarithromycin (Biaxin)
- Griseofulvin (Grisactin) Metronidazole (Flagyl)
- Ofloxacin (Floxin)Tetracycline
- Anticonvulsants: Carbamazepine (Tegretol)
- Phenytoin (Dilantin)

ORAL MOTOR PERFORMANCE:

↓ SPEECH ↓ MASTICATION ↓ SWALLOWING

- TISSUES INVOLVED ARE :-upper lip, lower lip , jaws, tongue, floor of oral cavity, soft palate etc.

SPEECH

Speech production is most resistant to aging but that doesnot mean there are no age related changes in speech.

- You can very well perceive differences when person of old age speaks but these are largely related to LARYNGEAL rather than oral events.

OTHER SPEECH CHANGES MAY OCCUR DUE TO:

- EDENTULOUS PATIENT(partial or complete)
- ILL FITTING PROSTHESIS.

Swallowing

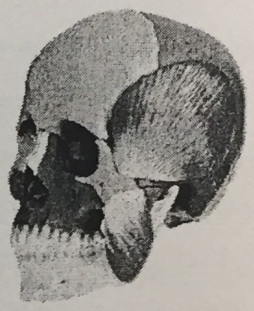
- Reduced chewing effectiveness
- Decreased tongue strength
  - Less muscle and an increase in fatty and connective tissue in the tongue
- Atrophy of the alveolar bone with lost dentition
- Increased swallowing time with age
- Swallowing disorders may be prevalent

SWALLOWING\ORAL MOVEMENT I N OLD AGE

- People chew slowly as they get older . Although the duration of the total chewing cycle does not seem to change, it does seem that vertical displacement of mandible is shortened.
- Movements of the mandible are governed by a generator in the brainstem & influenced by the proprioception in the muscles, joints, & mucosa.

Age may impair the central processing of nerve impulses, impede the activity of striated muscles & retard the ability to make decisions

- Poor motor coordination & weak muscles.
- ↓ no of functional motor units, fast muscle fibers & ↓ in cross sectional area of masseter & medial pterygoid muscles.
- Muscle tone decrease by 20-25% which probably explains the shorter chewing stroke & prolonged chewing time if it is there.
- Some individuals who assumes the characteristic STOOP of old age experience PAIN on swallowing because of osteophtes & spurs growing on the upper spine adjacent to the pharynx.
- Abnormal mandibular movements consequent to teeth loss,use of complete denture, deflective occlusal contacts.

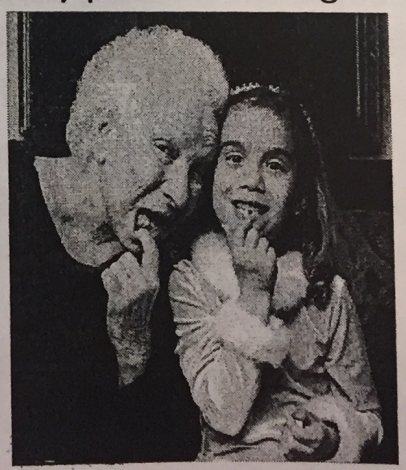


Atrophy of masticatory muscles AND
MASTICATORY ABILITY AND PERFORMANCE

Masticatory ability:
it is an individual's own assessment of his/her masticatory function
Masticatory efficiency:
it is the capacity to grind the food during mastication

- Essential that masticatory function (in complete denture wearers) be maintained through out life.
- Masticatory function depends on the skeletal muscular force and the ability to co-ordinate oral functional movements during mastication
- Maximal bite forces decrease in older patients
- Greater atrophy occurs in complete denture wearers especially women.
- Little evidence that new dentures reduce this atrophy

Wearing dentures does compromise masticatory performance greatly as compared to a natural set of teeth



AGE CHANGES IN MAXILLA AND MANDIBLE

To be continued in the next lecture----------

-Dr. Intisar J.Ismail

Good luck

Lect.24 *Continue------ geriatric dentistry related to prosthetic*

AGE CHANGES IN MAXILLA AND MANDIBLE

MAXILLA

- It resorbs in *UPWARD & INWARD* direction to become progressively smaller because of the direction & inclination of the roots of teeth & alveolar processes.
- Longer the maxilla is edentulous,smaller the denture bearing area will be.
- Incisive foramen becomes closer to the residual ridge

MANDIBLE

It resorbs in DOWNWARD & OUTWARD so as to become progressively wider thereby leading to class- lll relation.

Elderly patient →



- **Resorbed ridges**
- **Class III relation**
- **Retracted tongue**

CONSEQUENCES OF RESIDUAL RIDGE RESORPTION

- Apparent loss of sulcus width & depth.
- Displacement of muscle attachment closer to the crest of the residual ridge.
- Loss of vertical dimensions of occlusion.
- Decrease of lower facial height.
- Increase in relative prognathia.

- Ant. protation of the mandible (class-III)
- Changes in interalveolar ridge relationship
- Location of mental\incisive foramen close to the crest of residual ridge

Alveolar Bone

- Loss of teeth means loss of bone.
- Loss of alveolar bone leads to loss of vertical dimension.
- Osteoporosis – seen particularly in females after menopause.
- Effects are exaggerated by malabsorption syndromes.

AGE CHANGES IN TEMPOROMANDIBULAR JOINT

- The cartilage of the TMJ is essentially completely replaced by bone around the 4th decade of life.
- The articular tissue remains relatively unchanged in appearance throughtout adulthood,it may undergo metaplastic transformation into fibrocartilage, depending on the biomechanical loading to which joint was subjected.
- The articular eminence,in particular,is characterized by the presence of chondroid bone and very occasionally cartilage cell islands.
- Up through the 5th decade , the mandibular fossa even becomes more deep as the articular eminence continues to grow inferiorly,however after that time the articular eminence tends to become flatter,especially in individual

who have become partially or completely edentulous and have reduced loading force on the eminence.

Difference between young & adult condyle

YOUNG CONDYLE

- Condylar head more vascular
- Neck absent
- Bone is soft & pliable
- Cartilage is predominant in the child

ADULT CONDYLE

- Less vascular
- Neck is thicker
- Bone is less pliable
- Fibrous tissue predominant

Age changes in maxillary sinus

- With growth sinus enlarge laterally under the orbit & by the 2ndyear, they reach laterally to the infraorbital canals.
- By 9th year they extend to the zygomatic bones & to the level of the floor of the nasal fossae.
- Lateral growth ceases by the 15th year
- A large sinus may extend into zygomatic processes of the maxilla & into alveolar processes so that roots of molars & even premolar teeth lie immediately beneath the floor or project into it.
- In old age, bone enclosing the roots of posterior teeth sometimes resorbs leading to apex lie in the direct contact

with mucous membrane & extraction of such teeth may lead to fistula formation.

Oral Health and General Health in the Elderly

Oral health affects the elderly with regards to diet and nutrition intake, psychosocial interaction, and general well-being. The oral cavity is a portal of entry for microbial infections. Common oral diseases such as periodontal diseases and dental caries are the result of bacterial plaque accumulation.

Oral Health Problem in Elderly

- Tooth loss
- Denture related condition
- Coronal and root caries
- Periodontal disease
- Xerostomia
- Cancer and precancer

Risk Factors Associated with Oral Diseases and Conditions in the Elderly

Several studies suggested that 68-95% of persons 65 years or older take medication. The average number of drugs (prescription and/or non-prescription) used by this group is 1.4 to 4.3. With physiological aging and multiple pathologies, elderly patients are more susceptible to drug interactions and adverse effects . One profound side effect of multi-pharmacy is xerostomia. Without adequate salivary function, quality of life also is likely to be compromised

Oral Manifestations of Systemic Diseases

- Evidence of a systemic disease occurring elsewhere in the body is sometimes noted in the mouth.
- Diabetes
- Cardiovascular and thromboembolic diseases
- Osteoporosis
- Respiratory Diseases
- Possible use of pulp stem cells in treating diseases

Recent correlation studies have raised concerns about the possible linkage between Oral infection/chronic inflammation and systemic disease development/progression

Bacteria from the oral flora have been recovered from infection sites in other organs of patients with aspiration pneumonia or endocarditis.

The oral-systemic diseases linkage is a special health concern for the elderly since effective oral hygiene is usually compromised in patients with physical and neurological changes.

many systemic diseases and conditions have oral manifestations, which may be the initial sign of a number of clinical diseases. Oral examination and oral health evaluation should be integrated components of a routine physical examination.

Diabetes

- Increased frequency of tooth loss in diabetics associated with periodontitis
- Two-way street – each represents a risk factor for the other
- In addition to periodontitis, Type 2 diabetes related to other complications in the oral cavity including tooth decay, dry mouth, fungal infections and oral and peripheral

Neuropathies.

Diabetes is a risk factor for advanced periodontal disease and Candida infection.

Cardiovascular Diseases

- Linkage between periodontal disease and atherosclerosis and thromboembolic events
- Common basis for inflammatory responses, but cause and effect not established
- Independent causality.

Osteoporosis

- **Loss of alveolar bone associated with osteoporosis**
- **Implication of interaction with endocrine system**
- **Effects of Hormonal replacement treatment (HRT).**

recent reports raise concerns that patients undergoing long-term bisphosphonate treatment for metabolic bone disease or osteoporosis might be at risk for developing osteonecrosis of the jaw (called bisphosphonate-related osteonecrosis of the jaw;

American Association of Oral and Maxillofacial Surgeons 2007

Factors Increasing Susceptibility to Periodontal Disease

- **Systemic Diseases**
- **Arthritis/Poor Dexterity**
- **Cancer Therapy**
- **Medications**
- **Genetics**
- **Tobacco Use**

- Poor Nutrition
- Stress/Depression
- Removable Partial Dentures
- Microorganisms

Common Oral Diseases and Conditions in the Elderly

Similar to the general population,

- *caries and periodontal disease remain the two major dental problems in elderly patients.*
- *As gingival recession increases, resulting in dental root surface exposure to the oral environment, the prevalence of root surface caries increases in the dentate elderly population. 50%*
- *Candida infection and denture related lesions are common oral manifestations in geriatric patients.*
- *incidence of oral cancers also increases with advancing age.*

Ulcerative Lesions of the Oral Mucosa

- Physical ulcerations
  - Traumatic ulceration
  - Radiation mucositis
- Chemical ulcerations

Traumatic Ulcerations

Etiology:

- Lip and cheek biting.
- Motor dysfunction.
- Pressure necrosis phenomenon.
- Improper tooth brushing.
- Broken teeth.
- Irritation by faulty restoration.
- Improperly fitting removable prostheses.

- **Appearance:**
  - Ulcer with necrotic center and inflamed periphery.
- **Differential Diagnosis:**

- Aphthous ulcer, primary or secondary syphilis, erosive lichen planus, squamous cell carcinoma, and herpes simplex.

Treatment

Etiology must be identified and removed. If no resolution within 3-4 weeks (in elderly healing may take longer), lesion must be biopsied.

Larger lesions may require topical anesthetics, topical steroids or topical antimicrobials.

Radiation Mucositis

- **Appearance:**

- Diffuse erythema on all mucosal surfaces, followed by epithelial desquamation and ulceration.
- **Differential Diagnosis:**
- Oral candidiasis
- Recurrent herpetic stomatitis
- Erythema multiforme

Treatment:

Management of salivary gland dysfunction and candidiasis
Increase fluids and nutrients

Chemical Ulceration

Etiology:

- Prescription (e.g. chemotherapeutic agents, immunosuppressants)
- Nonprescription (aspirin burn) medications.
- Non-precious metal in prosthodontic appliances (cobalt-chromium and nickel-chromium alloys).

A white membranous patch that leaves a raw, painful area when scraped off.

Examples: aspirin burn, ulceration caused by drugs to treat cancer, arthritis, or prevent rejection of transplants.

Side effects of drugs used to treat systemic disease (e.g. Xerostomia, anemia, nutritional deficiency, leukopenia and lowering host defense response).

Treatment:

- Larger lesions may require topical anesthetics, topical antimicrobials, and topical corticosteroids.

Indirect consequences of wearing denture

RESIDUAL RIDGE REDUCTION

- Studies have established a continuous loss of the bone tissue after teeth extraction and the placement of complete dentures.
- The resorption rate varies by individual.
- Some say that RRR is physiological process that occurs because the use of the alveolar bone is lost after tooth extraction, however, RRR can proceed to the basal bone and hence is believed to be a pathological process and not a physiological one.

GAGGING:

Normal, healthy defense mechanism, prevents foreign bodies from entering trachea

Many stimuli cause gagging, such as irritation of the posterior part of the tongue, soft palate, even sights, tastes etc. can cause gagging

Due to dentures, patient may gag initially but gets accustomed.

Gaging may also be a symptom of disorders and diseases of the GIT, adenoids or catarrh in the upper respiratory passage.

Overdenture abutments :caries and periodontal disease

- The retention of selected teeth to serve as abutments under complete dentures is an excellent prosthodontic technique.
- However, bacterial colonization beneath a close fitting denture is enhances and leads to caries, due to microbial plaque of Streptomyces and Actinomyces (predominantly).

- If the plaque is left undisturbed, it initiates gingivitis in one to three days.
- Patients with overdentures demonstrate up to 30% increase in caries within one year.
- Preventive measures should be aimed at preventing the accumulation of plaque near the roots.

Nutritional Deficiencies

- Aging is often associated with a significant decrease in energy needs as a consequence of decline in muscle mass and decreased physical activity.
- There is a 30% fall in the energy however, with the exception of carbs, the nutritional requirement doesn't decrease with age.
- As a result dietary intake of elder individuals often reveals evidence of deficiencies clearly related to dental/ prosthetic status.

Severe nutritional deficiencies are rare in the healthy, even with impaired masticatory functions, it is only in hospitalized/ chronically ill patients that inability to chew and altered taste perception lead to negative dietary habits and nutritional status

Periimplantitis

- Soft and hard tissues surrounding osseointegrated implant show similarities with periodontium.
- Big difference in the collagen fibers being non-attached and parallel to implant surface instead of being perpendicular and in functional arrangement from bone to cementum.
- Periodontitis like process- periimplantitis affects implants and leads to loss osseointegrated implant.

- Bacteria play significant role in this, similar to periodontitis, failing implants include gingival inflammation, deep pockets and bone loss.
- Bacterial flora is gram negative rods e.g. *Bacteroides* and *Fusobacterium* sps.

Probing depths > 6mm and periimplant radiolucency

Allergic Reactions: Intraoral Contact Allergy Reactions

Poorly understood , not very commonly dealt with in specialized literature.

- No single or specific clinical picture of IOCA, lichenoid reactions common.
- Metals used in dental practice – e.g. amalgams ,Ni base metal alloys- cause reactions, hypersensitivity consequence .
- Common allergens: 2-HEMA (hydoxyethyl methacrylate) and triethylene glycol dimethacrylate.
- Methacrylates have rarely cause oral lichenoid reactions
- Methacrylates have rarely cause oral lichenoid reactions
- Replacement of restorations containing materials that give a positive epicutaneous test is not warranted.
- Allergy due to many nonspecific or unclear intraoral clinical disorders.

GERIATRIC PEOPLE PROBLEMS

- **HEALTH PROBLEMS**

1.Joint problems

2.Impairment of special senses

3. Cardio vascular disease

4.Cancer, Prostate enlargement,

5-Diabetes& Accidental falls

- Psychological problems

1. Emotional problems

2. Sexual problems

3. Mental disorders, Senile dementia, Alzheimer'disease

- Social problems

Poverty, Loneliness, Dependency, Isolation, Elder abuse

Conclusion

- **'Placement of removable prostheses in the oral cavity produces profound changes of the oral environment that may have an adverse effect on the integrity of the oral tissues.'**
- **Mucosal reactions occur from the mechanical irritation, accumulation of microbial plaque and occasionally due to allergic reactions.**
- **Dentures that function poorly may act as negative factors in muscle function**
- **Surface irregularities and micro porosities can greatly encourage plaque formation.**
- **At times, the local irritation may end up increasing the permeability of the mucosa to allergens, hence making it difficult to distinguish between simple irritation and an allergic response.**
- **Some bacteria can use the PMMA as a carbon source and hence the accumulation of bacterial plaque at the interface of the denture and mucosa causes several negative effects.** Good luck.